Vol. 24 JUNE, 1904 No. 142

THE FOUNDRY

PUBLISHED MONTHLY BY
THE IRON AND STEEL PRESS CO.
CLEVELAND OHIO

ESTABLISHED 1874

"The Best is the Cheapest"

There is no motto which applies better to

Foundry Facings and Blackings

No. 702 Pure Ceylon Plumbago
Reliance Blacking
"Esso" Plumbago Core Wash
Cream Talc
Special Brass Facings
Peerless Steel Facings
Sea Coal or Bituminous Facings

Manufactured exclusively by

THE S. OBERMAYER CO.

Cincinnati Chicago Pittsburg

WE are the largest manufacturers of Foundry Facings and Blackings in the world. Capacity of our three plants OVER ONE HUNDRED TONS PER DAY.

ESTABLISHED
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Now is the Time to Save and Make Your Foundry Profitable

You can do this by adopting all

MODERN AND UP-TO-DATE LABOR SAVING DEVICES USED IN HANDLING AND MELTING OF METALS

These are fully illustrated in our

GENERAL CATALOGUE No. 40 A

just published and ready for distribution and sent on request with express charges prepaid to any foundryman in the world

THE S. OBERMAYER CO.

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CHICAGO, ILL.
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Cable Address: "Esso" Cincinnati, O., U.S.A. A. B. C. Code

"Everything You Need in Your Foundry"

NEW

Paxson-Colliau Cupola

The more you examine it, the better you will like it . . . . . .

The Acme of Science in Cupola Construction . .

All that was Best in the old Colliau Cupola, with Every Improvement suggested by long experience added.

Location and area of tuyeres insure the . . highest melting . . . . efficiency . . . . . .

It keeps us hustling to fill the orders for these goods.

MADE ONLY BY THE

J. W. Paxson Co.

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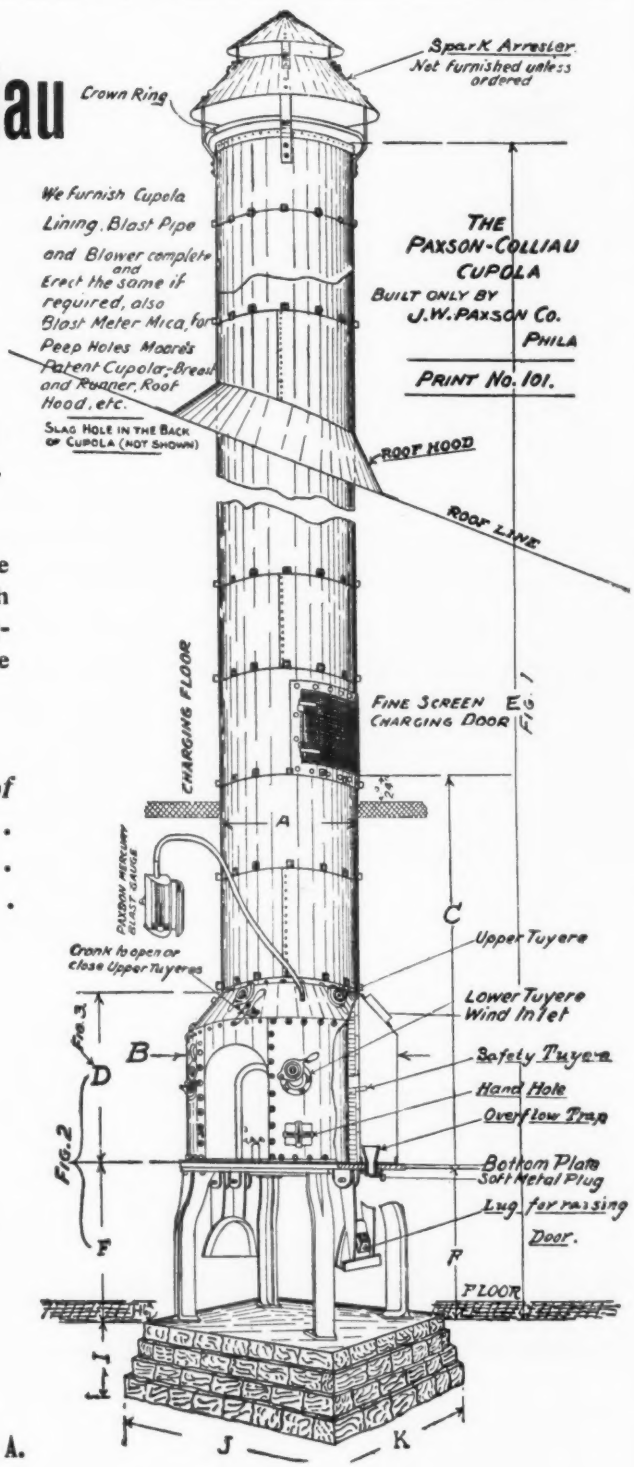
PHILADELPHIA, PA., - U. S. A.



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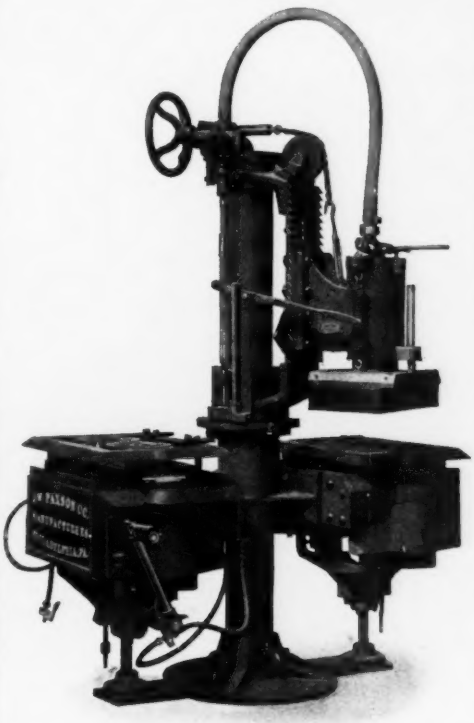


PAXSON-HALL

Molding Machine

is a DROP PATTERN, STRIPPING PLATE or VIBRATOR MACHINE.

If your plant is not equipped with compressed air, buy the table and at any time in the future instal air plant and procure the balance of the machine.

Call and see them in operation or write for circular.

We mount patterns for Molding Machines.

PAXSON-WARREN

Sand Blast Machine

IS CLEANING MORE CASTINGS
THAN YOU WOULD CREDIT.

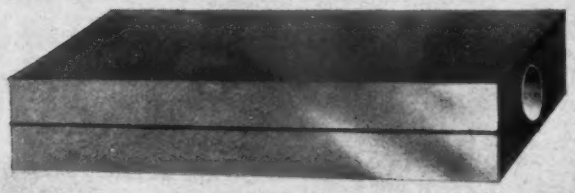
The price is within the reach of every Foundryman.

ASK FOR IT

PHILADELPHIA, PA.

PERFECTION CORE BOXES

PATENTED



FOR ACCURATE STRAIGHT ROUND

CORES

FROM ½" TO 6½" IN DIAMETER

ANY LENGTH DESIRED

MOST DURABLE & ACCURATE BOX MADE

HAS NO EQUAL

NO DOWEL PINS TO BREAK OFF

SEND FOR DESCRIPTIVE PAMPHLET

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SOLE MANUFACTURERS

CLEVELAND, O.

OUR REPUTATION FOUNDED ON MERIT, NOT AGE

We claim to make the BEST PLUMBAGO, FOUNDRY FACINGS and SUPPLIES produced in the United States today. This is a BROAD statement, but the truth permits of no qualifications; we either DO or we DON'T.

YOU WANT THE BEST

We honestly believe that our goods are SUPERIOR to those you are now using. We want you to know this, you to be the judge and decide upon the merits of our claim, after a thorough trial in your own shop on your own work.

Ground Goods

PLUMBAGO
INDIA SILVER LEAD
GRAPHITE
FOUNDERS' PERFECT WASH
CORE WASH
HEAVY MACHINE FACING
RHODE ISLAND FACING
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INGOT MOLD WASH
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CUPOLAS
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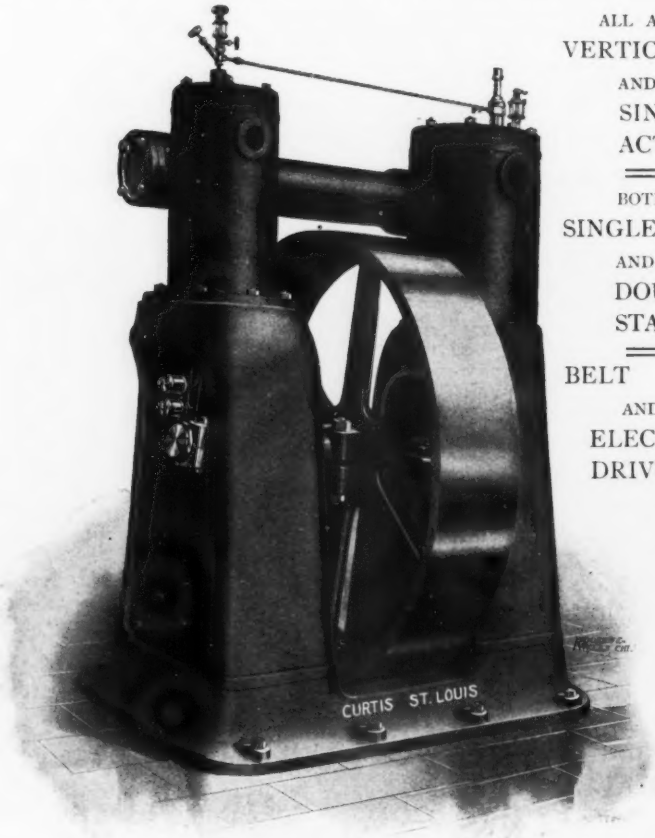
MALLETS
"SMOOTH-ON" IRON CEMENT
CRUCIBLES AND BRASS FOUNDERS' SUPPLIES

We have the courage of our convictions—what we want you to do is to give the goods a trial, and if, after the test is made, you do not agree with us, we will charge you nothing for the goods, but will expense the cost to over-confidence.

WE SELL THE BEST

Please bear in mind, our prices are no higher than you are paying. We ask for your patronage on the basis of giving you a BETTER value for the SAME money. It's only the first order we are asking for. You will send the others.

THE CURTIS TYPE
AUTOMATIC AIR COMPRESSORS



ALL ARE
VERTICAL
AND
SINGLE
ACTING

BOTH
SINGLE
AND
DOUBLE
STAGE

BELT
AND
ELECTRIC
DRIVEN

13 - 8 x 12 Double Stage Compressor. 150 revolutions.
138 cubic feet per minute

20 PER CENT SAVING IN POWER

over the ordinary type of double acting single stage

CURTIS & CO. MANUFACTURING CO.

ST. LOUIS

Baird Machinery Co., PITTSBURG . . Strong, Carlisle & Hammond Co., CLEVELAND
Walter H. Foster, New York . . . . . Hill, Clarke & Co., Boston

Perfection Electro Magnetic Separator

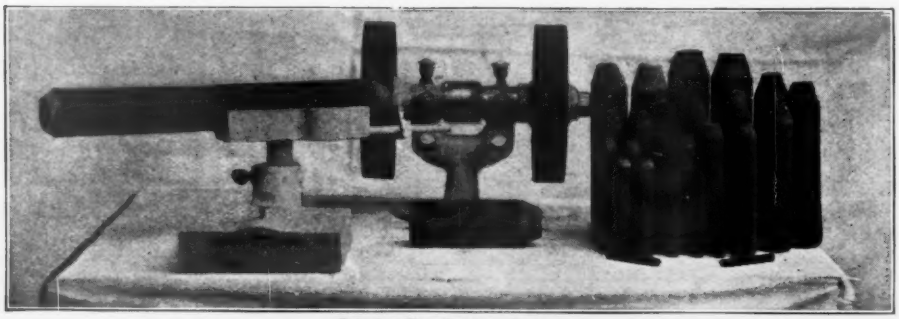
FURNISHED FOR DIRECT CURRENT
OR WITH DYNAMO

EXCELS ALL OTHER MAKES WRITE FOR PRICES

J. S. McCORMICK & CO.

Foundry Supply Depot. **PITTSBURG, PA.**

Ten Times Stronger Than Hand-Made Cores and Vented End to End.



Grinder For Coning Cores.

THE WADSWORTH Improved Stock and Standard Core Machine

makes sizes ⅜ to 6 inclusive. A 6 in. diameter core 24 inches long in 15 seconds, 200 to 600 ft. of cores per hour or 2,000 to 6,000 feet per day.

PATENTED JANUARY, 1902

OTHER PATENTS PENDING

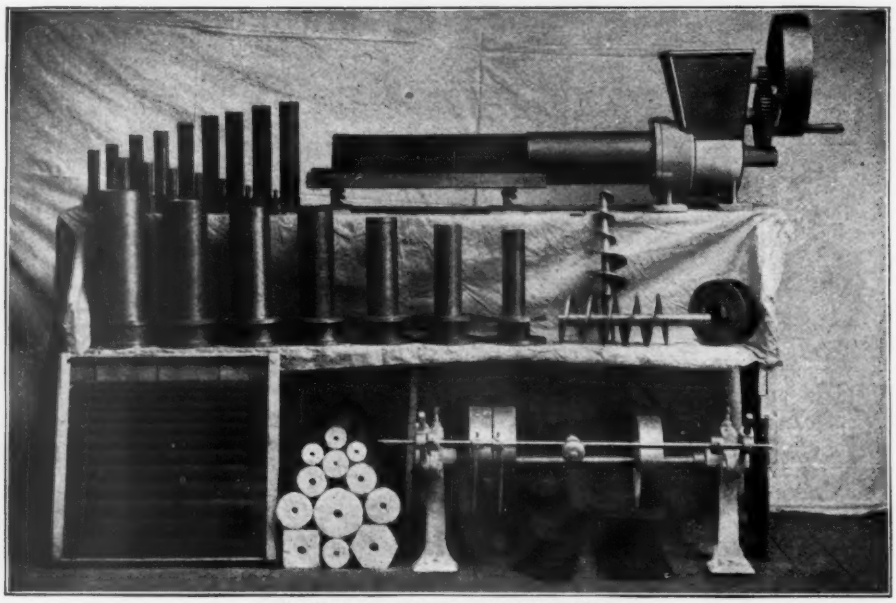
The stock cores are made in 24 in. lengths, baked, and coned with a special attachment, any length and any taper. All cores vented end to end.

We are pioneers in the Core Machine Business and Core Machine Specialists

THE FALLS RIVET & MACHINE CO.

CUYAHOGA FALLS, OHIO, U.S.A.

Better Cores For Less Money.



The Wadsworth Improved Core Machine.

TRADE MARK.

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C. S. LOVELL,
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Our Dry Sand Blacking

The Standard of Foundry Excellence

WHEN you use our DRY SAND BLACKING no time is wasted in investigation or experiment. The article is the result of a series of tests undertaken to find the best article obtainable for FOUNDRY FACING and the result gives us a blacking of the highest economic practical value. Anything having to do with the blackings or leads applied to mold dressing is directly of interest to us, for we deal exclusively in FOUNDRY FACINGS; make it our study and business. We could not afford to carry anything but strictly reliable goods and we are willing to send them on approval to be paid for when satisfactorily demonstrated their worth.

THE OLD WAY was to let the cleaning department scrape and wire brush castings. THE NEW WAY is to have all this done, and well done by the molder when he applies VULCAN BLACKINGS to the mold.

Insure yourself against defective castings, due to surface dirt, by using blackings for your moulds that are faithfully standing severe tests daily in many of the leading foundries and use the goods with the VULCAN stamp. It is a standard guarantee of material embracing every desirable merit necessary in facings in foundry practice.

For sale in Car Lots or smaller quantities

CEYLON, GERMAN AND AMERICAN GRAPHITES
Always on hand ready for immediate shipment in car lots

ANTHRACITE BLACKING FOR PIPE FOUNDRIES

SEA COAL FACING in bags or barrels

Give us a trial order

Our prices are so low and our deliveries so prompt we will surprise you

VULCAN FACING CO. **Easton, Pa.**

THE PRIDMORE

is a perfect

MOLDING MACHINE

It is
Accurate, Durable, Simple
and Efficient

It is the only Molding Machine built on the right principle

There are more sold than all other makes combined and they are continually replacing large numbers of machines of other types.

HENRY E. PRIDMORE,

Henry E. Pridmore,
19th and Rockwell Sts.,
Chicago, Ill

Please furnish the following supplies and ship promptly

6	9" x 12" 4 5/8" Draw Type "D"
8	12" x 12" 4 5/8" Draw Type "D"
1	14" x 14" 4 5/8" Draw Type "D"
1	16" x 16" 4 5/8" Draw Type "D"
2	18" x 18" 4 5/8" Draw Type "D"
1	20" x 20" 4 3/4" Draw Type "O"
1	24" x 24" 8" Draw Type "J"

Mr. Henry E. Pridmore,
19th & Rockwell Sts., Chicago.

GENTLEMEN:

SHIP

3 Sets 16"x16"x8" draw double shaft moulding machines-

2 " 18"x24"x8" " " " " "

2 " 24"x24"x8" " " " " "

1 " 14"x42"x6") Special)

1 single 30"x30"x12") " " " " "

1 set 16x16x4 3/8 drop Pridmore Std. Moulding Machine

To Henry E. Pridmore,
Chicago, Ill.

Please ship via Freight.

3, 16" Round 4-5/8" Draw Stand Moulding Machines.

1 Pair 10" x 15", 8" Draw Heavy Double Shaft Moulding Machines.

1 Pair of 12" x 14", 12" Draw Double Shaft Moulding Machines.

1 Pair of 18" Round 6" draw double shaft moulding machines.

1 Pair of 20" round 6" Draw Double Shaft Moulding Machines.

1 Pair 16" x 20" Special 12" Draw Double Shaft Moulding Machines.

1 Pair 28" Round 8" draw Double Shaft Moulding Machines.

1 Pair of 32" Round Special 9" Draw Double Shaft Moulding Machines

1 Pair 40" Round Special 10" Draw Double Shaft Moulding Machine.

1 Pair 48" Round Special 12" Draw Double Shaft Moulding Machine.

1 Only 60" Round Special 10" Draw Double Shaft Moulding Machines.

1 Only 60" Round Special 16" Draw Double Shaft Moulding Machine

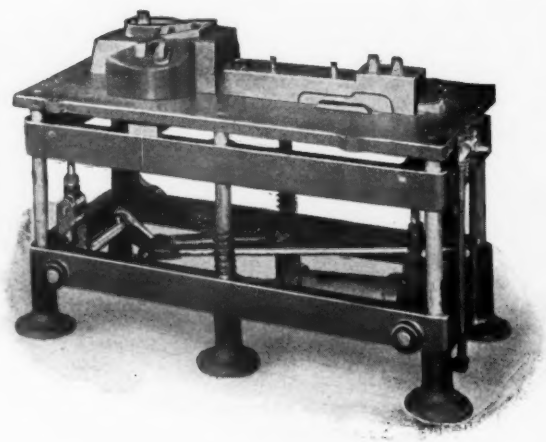
Quantity required weekly all

These orders were received within 30 days from 3 manufacturers who were formerly advocates and users of pressure machines.

CHICAGO, ILL.

Are You in the Ox Wagon?

If BEN HUR had driven an Ox Wagon in his celebrated race, he could hardly have expected to win. Yet *Ox Wagon Methods Prevail* in many foundries today, and in the race for profitable business, many foundrymen are losing ground.



Maywood Molding Machines

will help you to make money on jobs that must be taken at close prices on account of competition. Of course, there are other machines but none better than the MAYWOOD. :: :: :: :: ::

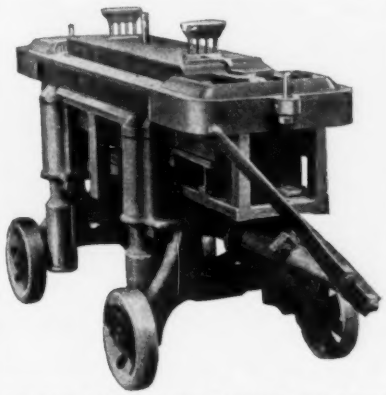
Because

Simplest in construction
Easiest to operate or change patterns
Most accurate in alignment
Most perfect in adjustment

Write today for particulars

Maywood Foundry & Machine Company

1606 Tribune Bldg., Chicago



DRAPER-TABOR HAND RAMMING MACHINE
A PLAIN STRIPPING PLATE MACHINE
—WITH A VIBRATOR IF YOU WANT IT

A PARTIAL LIST OF THE DIFFERENT MACHINES WE MANUFACTURE:

Hand Ramming Split Pattern Machines
Hand Ramming Stripping Plate Machines
Hand Ramming Vibrator Frame Machines
Foot Pressure Core Machines

(THOMAS-CLAIRE PATENT)
VERY FAST

MOLDING MACHINES

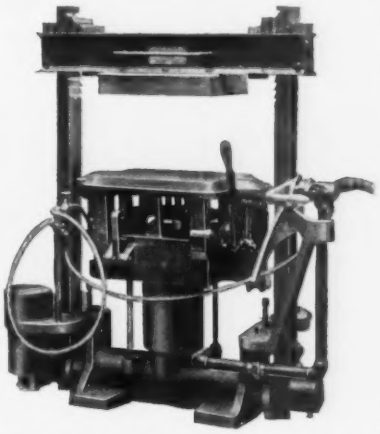
Power Ramming Split Pattern Machines

Power Ramming Stripping Plate Machines

Power Ramming Vibrator Frame Machines

Power Ramming "Squeezers"

Power Ramming Machines for deep work on which no hand work is necessary regardless of depth. Power Ramming Machines for very large work in flasks 34″ x 42″ to 40″ x 90″ for Steel Castings, TUNNEL PLATE SEGMENTS, etc.



LIGHT POWER RAMMING SPLIT PATTERN
VIBRATOR MACHINE WITH HAND DRAFT

The Tabor Manufacturing Company

18th and Hamilton Streets, Philadelphia, Pa.

Chicago Office
30 and 32 S. Canal Street

Fenwick Freres
Paris

49, Deansgate
Manchester, England

Schuchardt & Schutte, Berlin

MOLDING MACHINES

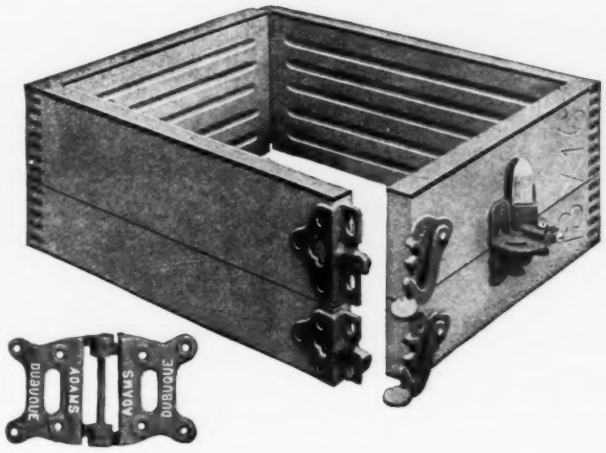
Send for Catalog No. 9

The Adams Company,

Dubuque, Iowa, U. S. A.

J. W. Jackman & Co., London, S. W., England
H. Glaenzer & Perreaud, Paris, France
V. Lowener, Copenhagen, Denmark

The Adams Cherry Snap Flask



Selected Dry Cherry

1 1-16 inches thick, is used in our flasks which alone costs more than all of the material used in the ordinary flask.

Corners

of the flask are machine locked, giving greater surface for gluing and a stronger joint than is possible to obtain from a dovetail or mitre.

Top Irons

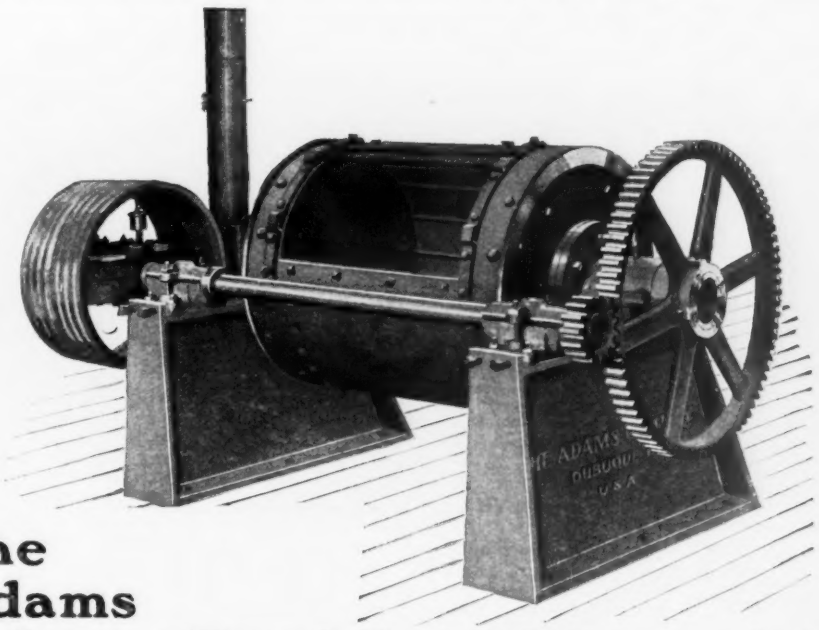
which protect the edges of both cope and drag are $\frac{1}{8}$ x 1 inch wrought iron with WELDED CORNERS, which make the flask more rigid.

Trimmings

are of malleable iron. The snaps are without doubt the quickest snaps to operate.

Pins and Ears

of malleable iron, have ¾ inch milled bearing on each side of the right angle. Fine adjustment in both ears is provided for by means of a screw on the ends of the ears. Both ears being adjustable, cope and drag are easily kept in line.



The Adams Exhaust Tumbling Mill

Send for Catalog No. 8

The Adams Company,

Dubuque, Iowa, U. S. A

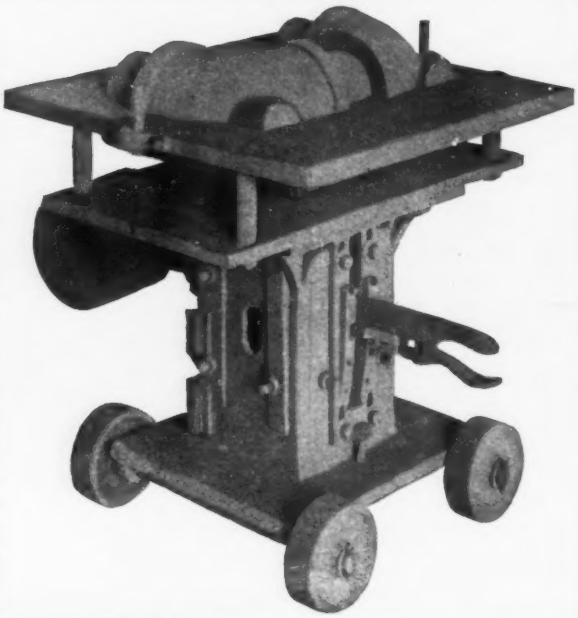
Ing. G. Pontremoli & Co., Milan, Italy
Wynmalen & Hausman, Rotterdam, Netherland

THE MOLDING MACHINE

NO FAD *but a* MAT-TER *of* ECONOMY

TO THE INTELLIGENT FOUNDRYMAN

Are you in this class, Mr. Proprietor, or Foreman?
If so, you ought to be using this machine.



IT IS

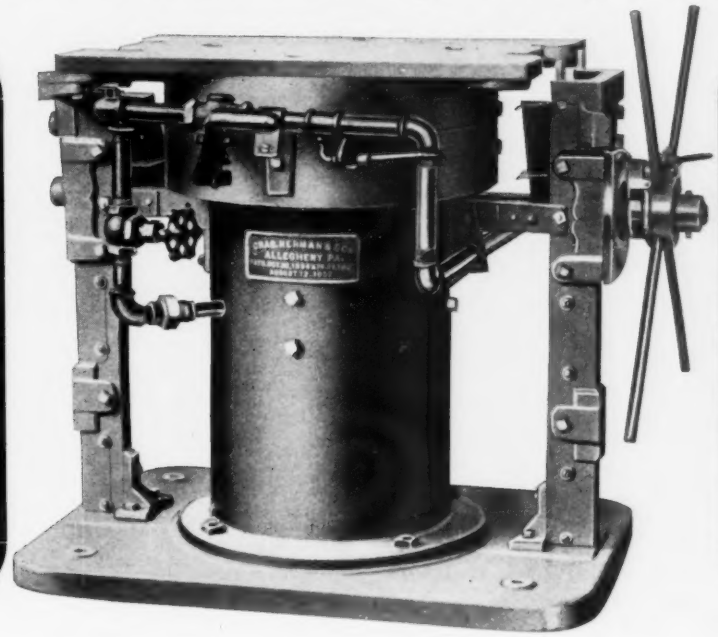
SIMPLE
EASILY ADJUSTED
NEVER BURDENED WITH A BILL OF REPAIRS
A MONEY MAKER

TAYLOR, WILSON & CO., LIMITED

102 GRANT AVENUE ALLEGHENY, PA.

The Deeper the Flask The Greater the Gain

Herman Pneumatic Jarring Molding Machine



When machine is installed it is not necessary to wait until stripping plates and interchangeable flasks are made.

Deep drag patterns, that you are using for floor work, may be placed on machine table, the machine does the ramming and the patterns are drawn by hand.

The machine jars or rams up a mold in a few seconds, makes a perfect mold and there is absolutely no blowing or scabbing.

The advantage over hand ramming alone is sufficient to pay the outlay for machine.

One of our customers says he is putting up a day's work the above way, in two hours.

When stripping plates are used, less operations are required and more molds can be turned out.

We lift stripping plates with air hoists attached to machine, requiring no hard work when there is a high lift, and the molds weigh from 200 to 1000 pounds.

WRITE FOR CATALOGUE

CHAS. HERMAN & SON

SHARPSBURG, PA.

Pneumatic Engineering Appliances Company, Ltd., Palace Chambers, Westminster, London, Eng., Foreign Representatives

THE Pulley Moulding MACHINERY

Built by THE E. A. DELANO CO., 50 to 56 S. Clinton St., Chicago, Ill.

IS IN USE IN THE FOUNDRIES OF

Utica Steam Engine & Boiler Works, Utica, N. Y.
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
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Lombard Iron Works & Supply Co., Augusta, Ga.
Woonsocket Machine & Press Co., Woonsocket, R. I.
W. A. Jones Fdy. & Machine Co., Chicago, Ill.
Southern Engine & Boiler Wks., Jackson, Tenn.
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Holyoke Machine Co., Worcester, Mass.
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BECAUSE THEY WANT TO MAKE

GOOD CASTINGS

WITH THE

LEAST EXPENSE.

We make machines to cast any size and description of iron pulleys between 3 in. and 72 in.

Our Catalogue P. M.-1 is yours for the asking.

ROOTS'

Established 1859

POSITIVE PRESSURE BLOWER

The only Positive Pressure Blower made with adjustable self-oiling bearings, for regular foundry work. Superiority in all other respects.
Write for catalogue.

P. H. & F. M. ROOTS CO.

Home Office and Works:
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120 and 122 Liberty St.

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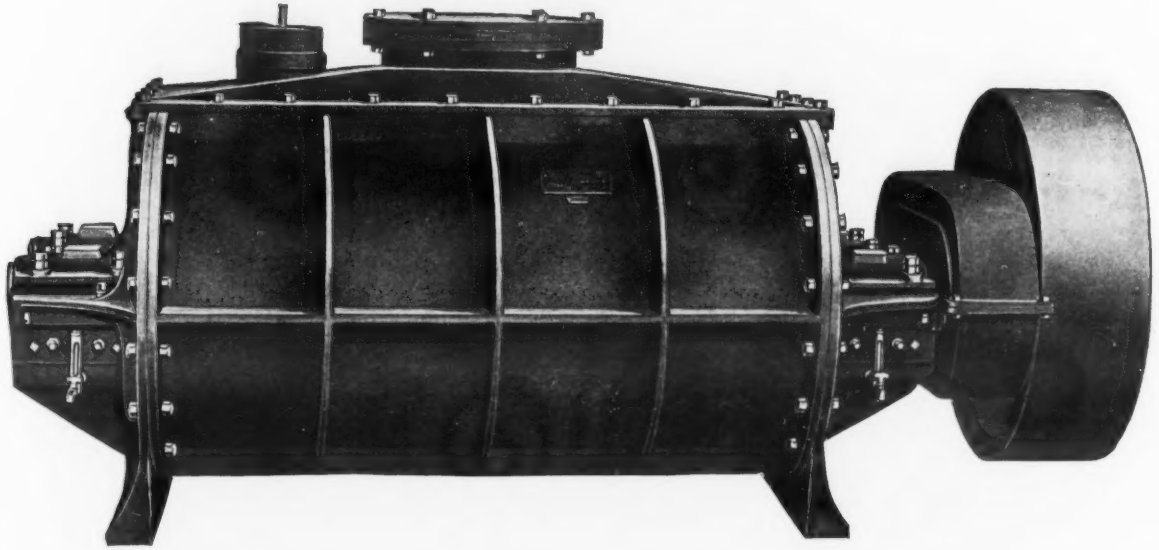


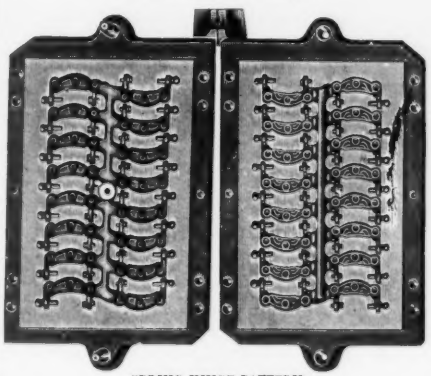
Our Latest Improved Foundry Blower.

The "Modern" Molding Machine

Especially Adapted for Making Small, Light Castings

PATENT PENDING

The "MODERN" is a Match Plate Machine designed to handle successfully a great variety of snap work. It has many features superior to other molding machines. In our own foundry we have developed a saving in the cost of our castings of 15% to 40%, according to the class of work, and get much more perfect and satisfactory castings.



SPRING HINGE PATTERN

DIMENSIONS when set up all complete ready for operation are as follows:

Height, 34 inches; length, 49 inches; width, outside wheels, 42 inches; weight, 1050 lbs.

The "MODERN" will take in flasks varying in size from a 10x10 to a 14x22 inches.

Write for our Catalog and further information

ARCADE MFG. CO. ═══ FREEPORT, ILL.

IT IS SAID An Ounce of Prevention is worth a Pound of Cure.

YET An Ounce of SMOOTH-ON often Saves when a Pound of Prevention Fails.

Before Using SMOOTH-ON Castings

After Using SMOOTH-ON Castings

Our SMOOTH-ON Preparations

are not fillers. Each one is made for use only under certain conditions.

Our SMOOTH-ON CASTINGS is made for the special purpose of repairing castings that are leaky under pressure or having sand holes or blow holes which affect their appearance only.

SMOOTH-ON here makes a permanent repair; in fact, the appearance of the casting in color and finish is the same as if it had been perfect at the start.

We also make SMOOTH-ON for the use of engineers and plumbers in repairing steam pipes, cylinders, radiators; in fact, anything of iron which is not perfect.

Our booklet of SMOOTH-ON Compounds should interest you. Write for it.

Meanwhile send for a small can and try its contents when you have trouble. You will soon send us a larger order when you know its good qualities.

Chicago Office, 61 N. Jefferson St. San Francisco Office, 61 Steuart St.

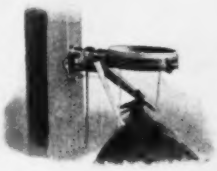
Agents for Great Britain, MESSRS. HODGSON HARTLEY LTD.
55 Victoria Buildings, Manchester, England.

The Smooth-On Mfg. Co.

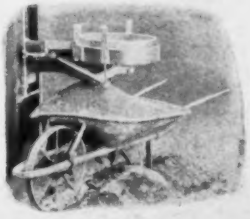
Analytical and Manufacturing Chemists

JERSEY CITY, N. J.

Hanna Portable Screen Shakers



POST SHAKER
With New Screen Clamp



POST SHAKER
For Use With Either Steam or Air

LARGE TRIPOD SHAKER
Weight, 210 Pounds Continuous Discharge

POST SHAKER
Weight, 50 Pounds

OBJECT To screen foundry sands by air or steam power. Maximum quantity at minimum expense.

CONSTRUCTION Entirely of Steel and Iron. Strongly and substantially built.

PORTABILITY Screens your sand where you desire to use it—right at the mold.

MOTOR Positive in action. Ample power under absolute control. Wearing parts well protected.

POWER Requires but little steam or air for the results obtained.

SCREENS Any mesh screen to suit your requirements. Changes can be made in a few moments.

CAPACITY Small machine all that one man would care to shovel. Large machine more than double this capacity.

STEAM The necessity of piping away exhaust makes steam machines practically stationary.

SPECIAL Machines designed to meet special requirements.

RESULTS Saves the enormous expense and hard labor usually incurred in screening sand by hand.

WARRANTY All machines warranted first-class in workmanship and material, and to operate successfully under reasonable conditions.

DELIVERY Shakers carried in stock. Shipments made upon receipt of order.

OLD MACHINES May be equipped with our latest improvements at little expense.

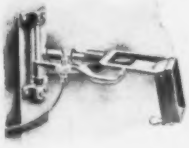
REPAIRS Repair parts carried in stock. If your old machine needs repairing write for prices.

QUESTION Can you afford to screen sand by hand in competition with these machines?

FINAL Full particulars and further information cheerfully given. Catalogue sent on request.

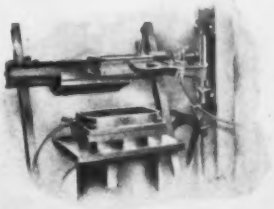
LARGE TRIPOD SHAKER
With Changeable Screen 2 ft. x 3 ft.

SMALL TRIPOD SHAKER
New Single-Acting Valve Machine



SWIVEL POST SHAKER
For Use With Pneumatic Moulding Machines

SMALL TRIPOD SHAKER
Weight, 100 Pounds



SWIVEL POST SHAKER
Shown in Connection with Moulding Machine

PERHAPS YOU WOULD ALSO BE INTERESTED TO KNOW ABOUT THE

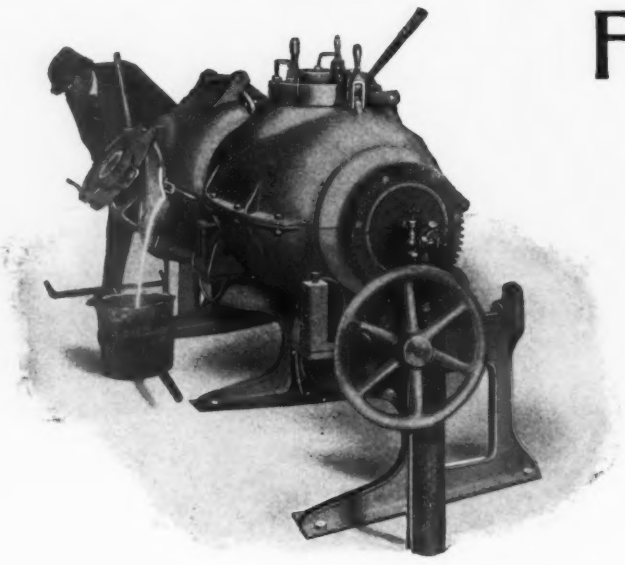
Hanna Quick-Vise

Hanna Compression Riveter

AND OTHER LABOR-SAVING TOOLS.

HANNA ENGINEERING WORKS, 820 ELSTON AVENUE, **Chicago, Illinois**

Rockwell Rotary Melting Furnace



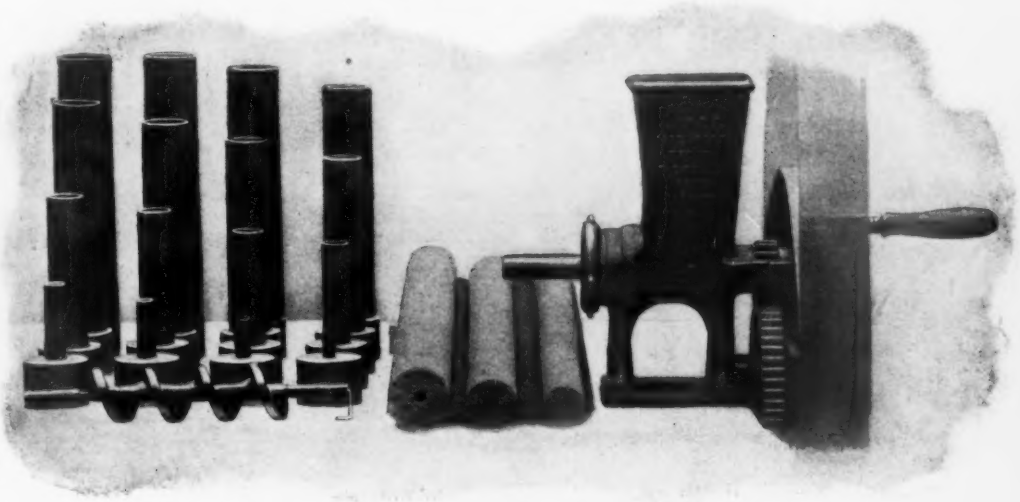
SAVES
FUEL
TIME
METAL

This furnace utilizes the heat from the spent gases of combustion. Two kinds of metal can be melted at the same time or both chambers can be used for one kind. The lining is an inexpensive material rammed into the furnace shell in bulk and burned hard and refractory in place. Large output for floor space required. No complicated parts or expensive repairs. Oil or gas is used as fuel, and the air for combustion is supplied from an ordinary fan. For general convenience and cleanliness, it is unequaled.

Made in four standard sizes ranging in capacity from 350 to 3,000 pounds each chamber.

ROCKWELL ENGINEERING COMPANY
26 CORTLANDT STREET
NEW YORK

ROUND, HEXAGON OR OVAL CORES, VENTED END TO END



STANDARD STOCK CORE MACHINE

Suit decided in our favor by the United States Circuit Court, October 13, 1903

Hundreds of Machines in daily use
Cores from 3-8″ to 6″

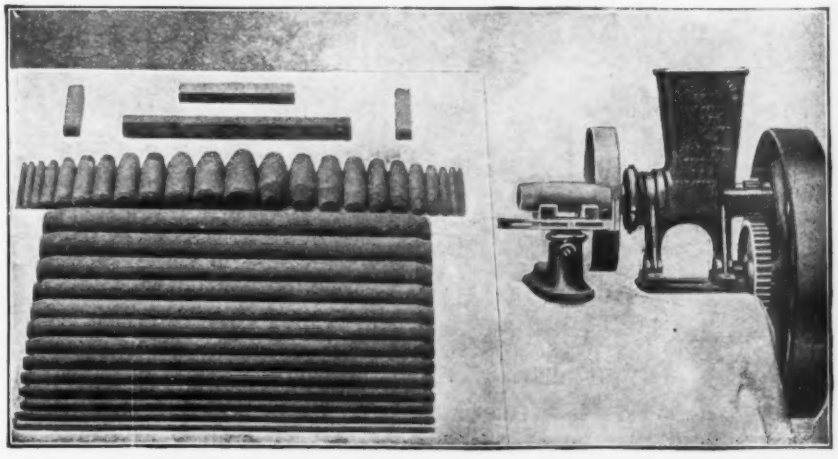
Send for new Catalog

The KENT MANUFACTURING COMPANY

— FORMERLY —

THE RAILWAY SPEED RECORDER CO.

Kent, Ohio, U. S. A.



CUTTING OFF ATTACHMENT

The "Bang Up" Plants

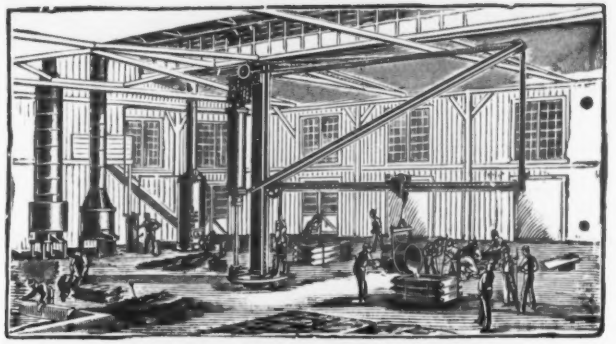
Use Ridgway Steam-Hydraulic Cranes and Elevators.

For example, the most splendid establishment in the land for making pipe has just been erected by the Harrisburg Pipe & Pipe Bending Co. of Harrisburg, Pa.

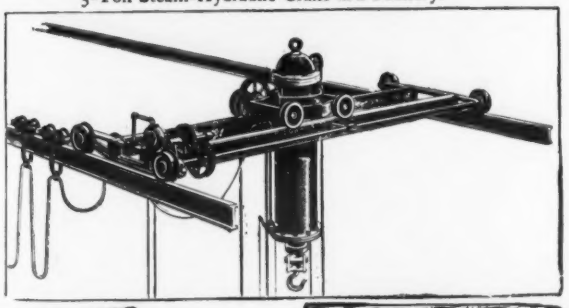
That's an awful name for a 20th century company, but they have a crackerjack plant all right, designed by men who know something, having grown up along with the business.

They are putting in Cranes here and there and the other place, and, of course, are using the Ridgway Steam-Hydraulic Cranes wherever they can.

This is how the most modern and finest plants rig themselves out, and if you are real smart you will get your work close to the boiler, too, and skip pumps, dynamos, air compressors and other tomfoolery. Dear me ! Aren't you sick enough of such things, with their continual need of attention and repairs?

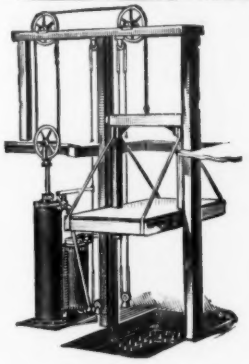


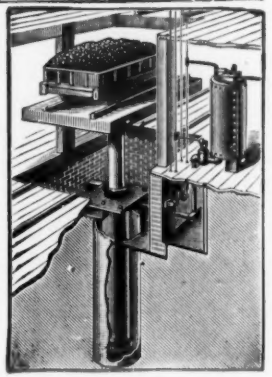
5-Ton Steam-Hydraulic Crane in a Foundry.



OIL GOVERNED AIR HOISTS

Surely and not slowly coming to their own.
People are finding out about Air Hoists.
Don't you want good Air Hoists for your money ?
All these go in guaranteed.





PLEASE TAKE THE ELEVATOR
"Hook'er to the Biler."

CRAIG RIDGWAY & SON CO., Coatesville, Pa.

European Agent, CHAS. G. ECKSTEIN, 49 Kaiser Wilhelmstr., BERLIN, GERMANY.

IRON AND STEEL CASTINGS MADE PERFECT

CAN WE BACK IT UP? TRY US

CAST STEEL CEMENT

WILL QUICKLY PROVE OUR CLAIM

FREE SAMPLES
UPON REQUEST

It is a Permanent Cement—No mere filler-up or smoother-over—it becomes part of the casting itself. It is the pioneer—It is peerless—It is imitated, but never equalled.

ELEVEN YEARS CONSTANT USE

BY IRON AND STEEL WORKERS IN ALL LINES

The best foundry practice does not entirely avoid castings imperfect in appearance only, the strength and efficiency not affected, and they are made perfect by CAST STEEL CEMENT for iron and steel castings.

THE CLARK Write for free sample

TRADE

CAST STEEL

MARK

Write for free sample **CEMENT CO.**

SHELTON, Conn., U. S. A.

Agents: J. W. JACKMAN & CO., 39 Victoria St., London, Eng.
BENJAMIN G. ELLIOTT, 33 Tehama St., San Francisco, Cal.
J. HOWARD JONES & SON, 355 Dearborn Street, Chicago, Ill.
WILLIAM ABBOTT, 334 St. James St., Montreal, P. Q.

European Agent, CHAS. G. ECKSTEIN, 49 Kaiser Wilhelmstr., BERLIN, GERMANY.

Hammer Core Machine

Makes perfectly round cores from
$\frac{3}{8}$" to 2-$\frac{1}{4}$" in diameter

Over six hundred in use

ADVANTAGES

No core boxes required	Less oven space needed
No ramming of sand by hand	Less fuel required
No uneven vent holes	Less breakage
No trimming or filing of cores	Less complaint from your customer

Send for catalogue and sample of core

BROWN SPECIALTY MACHINERY CO.

N. W. Cor. Jackson and Clinton Sts.

CHICAGO, ILL.

Perfect Castings

can be obtained every day in the year if you use Clark's Metallic Filler.

The days are past when you had to throw castings away because they contained blow holes, cracks, uneven surfaces, etc., etc.

Of course you threw away a good part of your profits, too.

Clark's Metallic Filler

has changed all that.

By filling up all blow-holes, cracks, etc., it transforms imperfect castings into perfect ones.

It enables you to get every possible cent of profit out of your foundry.

That's just what you want, isn't it?

Then use this cement for a single day and see the truth of our claim.

Send for a free sample *NOW*.

D. N. CLARK

DRAWER 11

SHELTON, - CONN.

MODERN FLASKS

"Made a little better than seems necessary." It is a pleasure to work them.

IMPROVED RIB

FOR

BRASS FOUNDRIES.

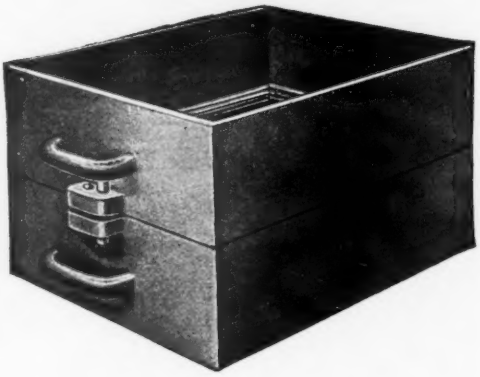
LARGE STRAIGHT SIDE FLASKS

For Floor Work.

MOULDING MACHINE FLASKS

FOR

IRON, BRASS AND STEEL FOUNDRIES.

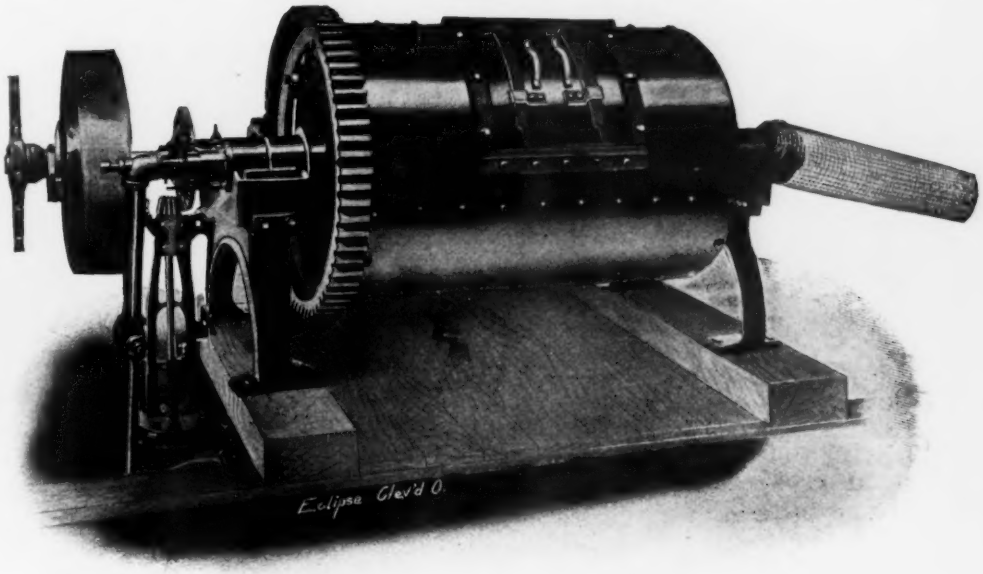


New issue—Complete Equipment for Brass Foundries—Cat. No. 12.

Brass Founders' Supply Co.

Newark, N. J.

THE FOUNDRYMAN'S KLONDIKE



THE SLY PATENT CINDER MILLS

The aggregate saving of these mills now in use amount to more than 15,000 tons of iron annually in the United States and Canada. Cost of recovering the iron does not exceed two dollars per ton.

This machine grinds the cinder and separates the iron and coke from the dirt in one operation. It recovers 95 per cent. of the iron and 75 per cent. of the coke.

How long will you continue to let this amount of material go to waste ?

The only mill on the market giving perfect satisfaction.

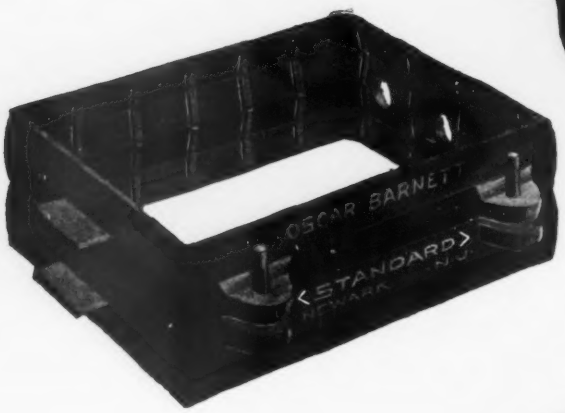
The W. W. Sly Mfg. Co.

CLEVELAND, OHIO

BRASS MOLDERS' FLASKS

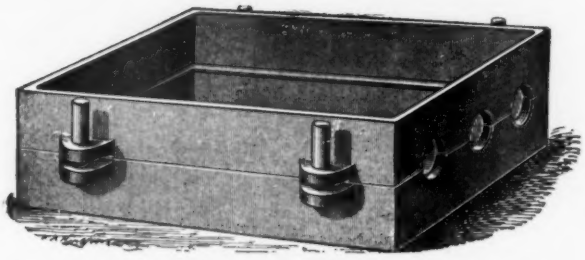
OF EVERY STYLE AND SIZE

Furnaces, Drying Stoves, Spill Troughs, Clamps, Boards, Tongs, Crucibles, etc., etc.



All our flasks interchange with any of same size made by us.

Our own foundries ensure prompt shipments



THE OSCAR BARNETT <STANDARD> FLASK

IS MADE ONLY BY

Oscar Barnett Foundry Co.

Founded 1845 **NEWARK, N. J., U.S.A.**

The "A B C" Disc Ventilating Fans

WILL satisfactorily ventilate your foundry, adding to the comfort (hence the efficiency) of your workmen.

These Fans are so constructed as to handle large quantities of air, with minimum power. They are strong, durable and efficient.

Send for Catalogue No. 161 B.

American Blower Co.

DETROIT

New York Chicago London

NOTICE of REMOVAL!

B. F. Sturtevant Co.

The entire plant from Jamaica Plain

TO HYDE PARK, MASS.

Nine acres of floor space, 2½ times larger than former plant.

B. F. STURTEVANT CO.

HYDE PARK, MASS.

Boston New York Philadelphia Chicago London

376

CUPOLA SPARKS

Letters from Josiah Short, practical foundryman, to Jim, foundry superintendent, who has left the former's employ in the capacity of a molder to operate a new foundry.

Dear Jim:

Never heard of the iron you state you are using, and judging from your results, I, in your position, would not want to hear of it again. The furnace that is shipping you this stuff was never known to make anything but Bessemer and basic, and only goes after the foundry trade when the steel business is on the bum. I'll bet a campaign plug to an opera hat that you can't get a pound of foundry iron from this furnace when the steel trade is brisk, and your trade is only sought when there is no demand for steel making irons. I judge from what you write that this iron was offered as a sacrifice, just to get you to try it, and from the tonnage you closed for you certainly swallowed the bait, hook and all. Your percentage of bad castings has already swallowed up all possible profits, and if you persist in using what is coming in, your profits on the wrong side of your ledger from bad castings will be so great that several boom years can't pull you out of the hole. Take my advice and get some old and well established standard grade, and when you have one that satisfies you stick to it.

Change your mix right away, and take the rest of the iron coming in and bury it in your stock yard. It might come in handy some day when tin cans are scarce and the sash weight market lively. I have had all the experience I want with this so-called foundry iron that is made by furnacemen when they have nothing else to make. Rebecca iron is made at a furnace where they make nothing but foundry iron from the day the New Year is born until it is laid away, and they don't ship you a lot of cats and dogs and label it foundry iron just because they can get a better price for it, and in my years of dealing with them I have never yet had to reject a single car.

Respectfully,

JOSIAH SHORT

No. 1 REBECCA FOUNDRY IRON No. 2
Always Uniform

Kittanning Iron & Steel Manufacturing Co.

FOUNDRY AND FORGE IRON
AND MUCK BAR

Offices:
Farmers Bank Bldg.
Pittsburg

Furnace and Mills
Kittanning, Pa.

N. S. Bartlett & Co., 126 State Street, Boston, Mass., Eastern representatives.

ALWAYS THE SAME
AND ALWAYS
THE BEST

STRONG

For 28 years the standard soft strong foundry iron.

SOFT

CHERRY VALLEY QUALITY

FLUID

Used by foundrymen who want the best possible results.

UNIFORM

The Cherry Valley Iron Co.

PITTSBURG, PA.

PIONEER PIG IRON

Is of the highest grade and always uniform. The ores and fuel used in its manufacture are entirely under the control of the Company and produced from their own mines adjacent to furnaces. If you use Pioneer Iron once, you will always desire to have it in your mixture. No trouble with your castings afterwards. It costs no more and is better than other standard grades. Let us have your inquiries.

For prices write,

THE REPUBLIC IRON AND STEEL CO.,

CHICAGO, ILL., BIRMINGHAM, ALA.

Or the following Sales Offices:

CLEVELAND, OHIO, ST. LOUIS, MO., ST. PAUL, MINN., BUFFALO, N. Y., CINCINNATI, OHIO, PITTSBURG, PA.

COM-PRESSORS PNEUMATIC TOOLS ROCK DRILLS

FOUNDRY TOOLS

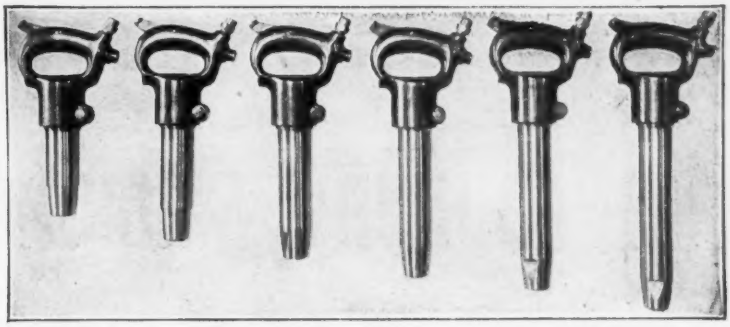
Such as Chipping Hammers and other Air Tools, save time and labor.

AIR COMPRESSORS

of the best patterns—in all sizes.

Send for Catalogue E, which will tell you about them and will acquaint you with the "Imperial" family

RAND DRILL CO. 128 BROADWAY N.Y.



Saving Seconds

Nearly all shops have emergency work, when every minute counts. Quick work sometimes saves lives, as well as dollars.

Keller Pneumatic Tools

are tremendous time-savers. For cutting out old boiler-tubes, or rolling new ones, their speed is marvelous. At riveting, chipping, drilling, calking, or ramming, they work with unequaled rapidity, and hardly ever need repairs.

Write for our new catalogue and booklet on the "Care and Use of Pneumatic Tools."

PHILADELPHIA PNEUMATIC TOOL CO.
21ST ST. & ALLEGHENY AVE.,
PHILADELPHIA.
NEW YORK CHICAGO PITTSBURGH
SAN FRANCISCO BOSTON

William Sellers & Co., Incorp.

PHILADELPHIA, PA.

MODERN FOUNDRY MACHINERY

SAND MIXER

Not an Experiment

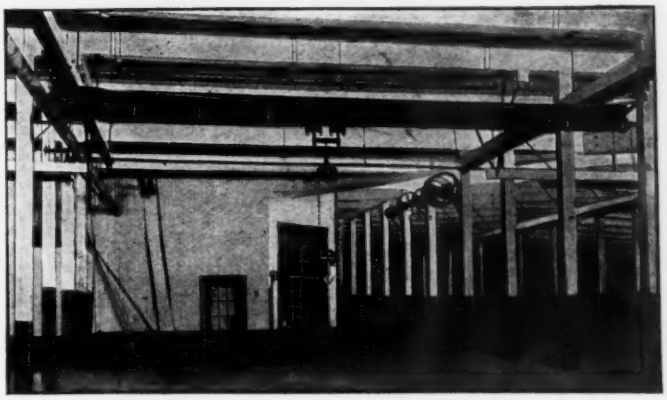
PRACTICAL
ECONOMICAL
EXPEDITIOUS

NOTE. — In order to clearly explain the **Modus Operandi** of this scientific and practical method of **mixing Molding Sand, Facing Sand** and **Core Sand,** we have issued a small pamphlet which will be sent on application.

TRAVELING CRANES FOR FOUNDRY USE.

Correspondence is Solicited.

THE IDEAL WAY



THE COBURN WAY

EVERYTHING

carried on trolley tracks. A spur to the flask yard, another to the sand shed, another to the cleaning room and still another to deliver iron to the molders. Flasks, sand, castings or iron taken to any floor without fuss about gangways. The only apparatus for handling materials that's in nobody's way. Think how this would increase the output of your plant, then let us tell you more about

COBURN TROLLEY TRACKS

and how they may be arranged for your particular needs.

Coburn Trolley Track Mfg. Co.

HOLYOKE, MASS.

The Millett Way

MORE AND BETTER CORES AT LESS COST

A MILLETT CORE OVEN

will bake different sized cores at the same time and bake them just right, because they are placed on hinged shelves that swing in and out keeping the oven closed whether open or shut. No wasted heat. No broken cores. Just satisfaction.

THE MILLETT CORE OVEN CO.

Brightwood, Mass., U. S. A.

SALES AGENTS: S. Obermayer Co., Cincinnati and Chicago J. W. Paxson Co., Philadelphia
J. W. Jackman & Co., London J. S. McCormick Co., Pittsburgh, Pa.

PER 14 cts. GALLON

DID YOU ever hear of anything quite so inexpensive? Especially for a Core Compound. It's the grade we call "Stock" and it's good enough for anything except cylinder work. Our "A" grade for that class. We are speaking of

CROIL

You've seen it advertised before, but you have never sent us a trial order or even asked for prices. Now we're telling you our price. Please reciprocate.

CHARCOAL FACING

is another product in which we excel. Ground in any size. If you had samples of several grades you could tell better what you want. We'll send 'em.

FOR SALE BY

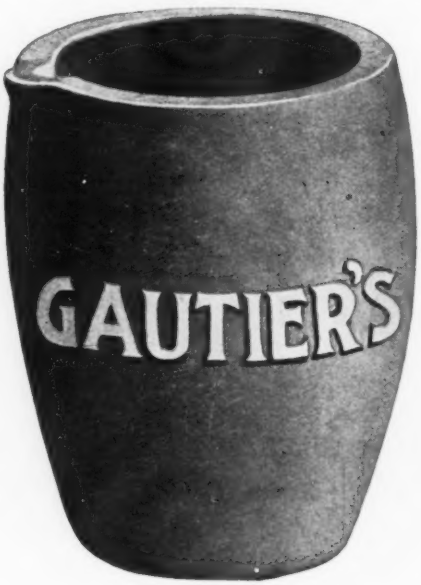
The Hill & Griffith Co., Cincinnati, O.
J. S. McCormick Co., Pittsburg, Pa.
Buffalo Foundry Supply Co., Buffalo, N. Y.
J. D. Smith Foundry Supply Co., Cleveland, O.
Springfield Facing Co., Springfield, Mass.
T. P. Kelly & Co., New York, N. Y.

MANUFACTURED BY

Williamsport Chemical Co. WILLIAMSPORT, PA.

Manufacturing Chemists

The Crucible of Satisfaction



Proven so by nearly fifty
years of testing
in all kinds of service.

J. H. GAUTIER & CO.
JERSEY CITY, N. J.

What are your Special Needs?

THE making of the Dixon Crucible is not a one-formula proposition. There are as many changes in our mixtures as there are special melting needs and that is why you are getting the best possible when you order a

DIXON

What kind of melting do you have to do?
Let us hear from you

Joseph Dixon Crucible Co.
Jersey City, N. J.

McCULLOUGH-DALZELL

A brass foundry equipped with McCullough-Dalzell Crucibles is assured the highest crucible efficiency attainable. They are made of the best materials by experts. The increasing demand indicates their superiority. Full particulars will be cheerfully furnished interested parties.

McCullough-Dalzell
Crucible Co.
Pittsburg
Pa.

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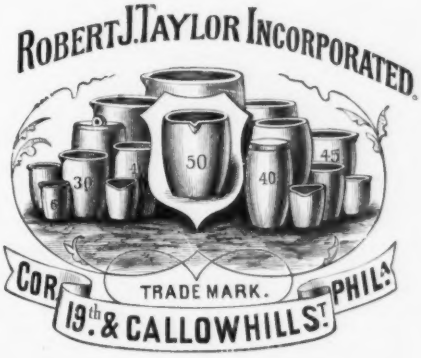


This trade mark stands for the acme of crucible uniformity.

There's no guess work in the manufacture of a Taylor Crucible. Only the highest grades of material are used, and working strictly by our chemical analysis, we give a uniformity in the quality the year round, that is not approached.

A trial will convince you.

Robert J. Taylor, Incorporated

1900 to 1916 Callowhill Street

PHILADELPHIA, PA.

Five-Motor Electric Traveling Gantry Crane. Capacity fifty tons in middle of bridge. Ten tons at ends of cantilevers. Trolleys: capacity, twenty-five tons each. Total length of bridge, one hundred sixty feet. Furnished Vermont Marble Company. Quarries at West Rutland, Vt.

ELECTRIC TRAVELERS

CRANES OF ALL KINDS

ALL TYPES

ENGINEERS, DESIGNERS AND MANUFACTURERS

COMPLETE EQUIPMENT FOR

GRAY IRON, CAR WHEEL AND PIPE FOUNDRIES

MALLEABLE AND STEEL CASTING PLANTS

1300 IN USE

Catalog "F" on request

WHITING FOUNDRY EQUIPMENT CO.

GENERAL OFFICE AND WORKS: HARVEY, ILL., U. S. A. (CHICAGO SUBURB

THE FOUNDRY

Vol. 24, No. 4. CLEVELAND, OHIO, JUNE, 1904. Whole No. 142

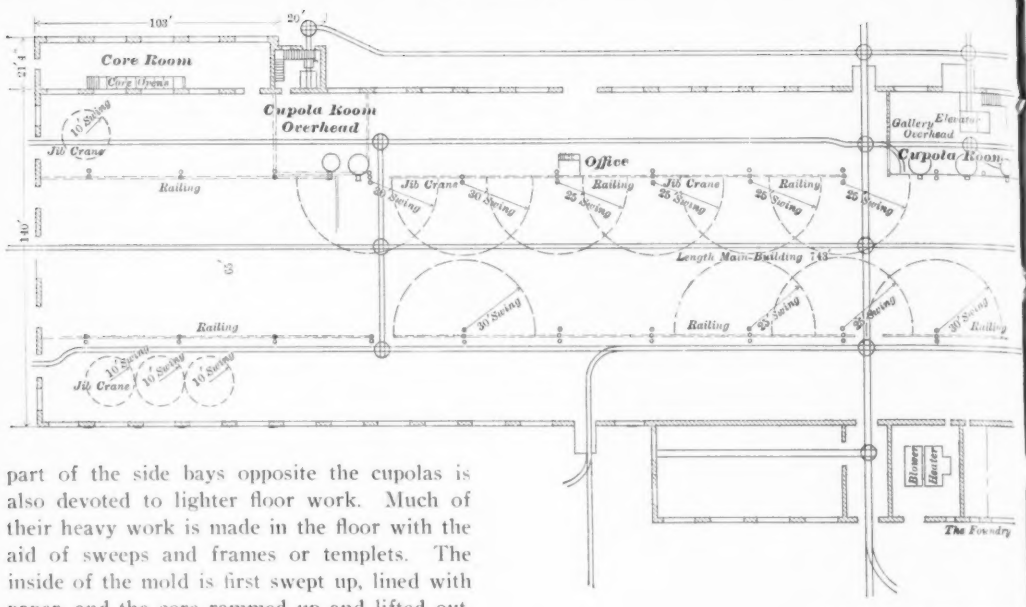
Iron Foundry of the General Electric Company, Schenectady, N. Y.

In May, 1899, we published a description of the then new foundry of the General Electric Co., Schenectady, N. Y. At that time the main foundry was only 503 feet long. Since then an addition has been built to the main building, making it 743 feet long, two new cupolas have been added, also considerable new equipment, and some of the old equipment remodeled in the light of experience obtained by using it, or to meet new conditions. For these reasons we believe that a description of the plant as it now stands will be of considerable interest to readers of *The Foundry*, as it shows one of the large specialty foundries in which a very great variety of work is to be handled. The plant is thoroughly equipped throughout and one of the factors which strikes a person on visiting the foundry is the way in which they have called upon the entire range of foundry appliances to serve them in reducing costs and increasing output. Some people who are manufacturing certain lines think that they must use their line of apparatus only, for if their customers visit their works and find other apparatus installed they may think that the manufacturer doubts the universal application of his own product. Not only is the foundry equipped with a considerable amount of electric machinery, but compressed air is made use of to a much greater extent than in many similar plants.

CENTRAL BAY OF FOUNDRY.

General Molding Floors.

The foundry is divided into three bays, the central bay being 65 feet wide and the side bays about 30 feet. The entire central bay is devoted to heavy floor molding. The greater



FLOOR PLAN OF FOUNDRY

part of the side bays opposite the cupolas is also devoted to lighter floor work. Much of their heavy work is made in the floor with the aid of sweeps and frames or templets. The inside of the mold is first swept up, lined with paper, and the core rammed up and lifted out. The paper is then removed and the thickness of metal swept out, after which the cope and core can be returned to their proper position. The foundry is well lighted by means of windows in the sides, from the monitor roof of the central bay and skylights over the central and side bays. The general foreman's office is situated at one side and projects into the side bay opposite the cupolas, so that he has an unobstructed view of the greater portion of the molding floor. There are several other small offices, at different points in the foundry and cleaning departments for the use of the department foremen.

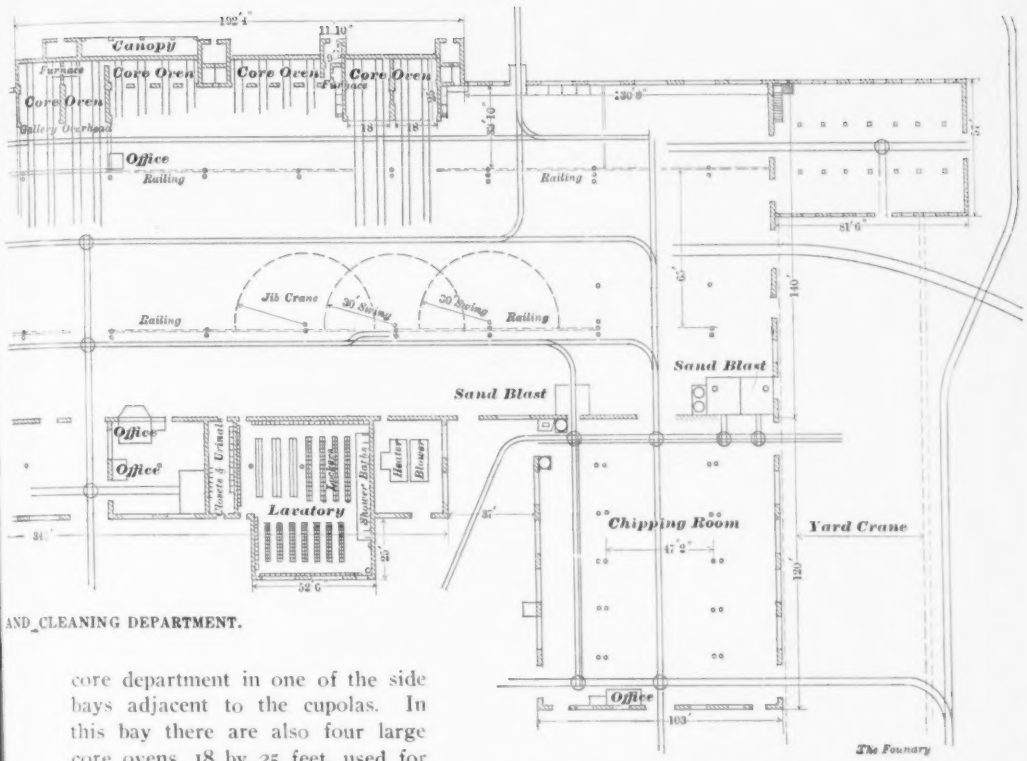
Molding Machine Equipment.

Much of the work manufactured is of a special nature so that it can be put up on molding machines. For this purpose some large machines are located in the central bay, but most of them are situated in the side bays or along the line of posts under the crane runways. One exceedingly interesting application of the molding machine is found in one of their core departments in which they are putting up intricate cores on ordinary Tabor molding machines. These machines are plainly shown in one of the illustrations, together with the Millet core ovens used for drying these cores.

VIEW OF FOUNDRY, ELECTRIC RAILWAY,

Core Departments.

In addition to the cores made on molding machines already mentioned, they have a large



AND CLEANING DEPARTMENT.

core department in one of the side bays adjacent to the cupolas. In this bay there are also four large core ovens, 18 by 25 feet, used for drying large molds. The small cores are dried in ovens which are provided with trucks or cars having a door at each end, so that the great heat of the oven interfered seriously with the operation of these cylinders and necessitated the placing of them outside of

CLEANING BUILDING AND YARD CRANE.

oven is closed, no matter whether the truck is in or out. As originally installed and described in our former article, these trucks were operated by pneumatic cylinders located inside of the oven and under the car, but the the oven, as shown in one of the illustrations. In order to economize space, racks for the storage of cores have been placed over the cylinders. This pneumatic arrangement operates the trucks so easily that it is possible for a

FLOOR MOLDING.

CORE OVENS WITH TRUCKS OPERATED BY COMPRESSED AIR.

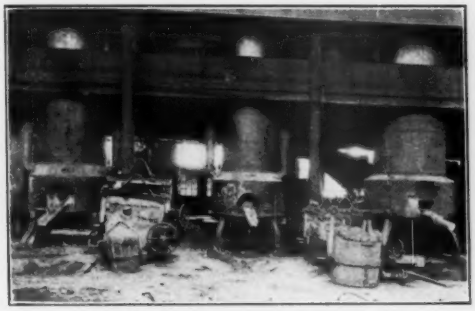
man to come to the oven with a plate of cores in his hand, run the truck out with the other hand, place the plate upon it and return it with perfect ease.

Handling Devices.

The entire works is served by a narrow gauge electric railway system, so that cars can be run to any part of the yard and into most of the building without difficulty. In the general views of the exterior of the foundry it will be noticed that a train of these cars loaded with castings is leaving the foundry and the style of electric locomotive in use is plainly shown. These cars can be run into the foundry and castings loaded on to them by the regular traveling cranes. The coke, pig iron, and other supplies are also handled on suitable cars. The central bay of the foundry and the bay opposite the cupolas are both spanned by a number of electric traveling cranes which serve the entire floor. Beneath these traveling cranes there are arranged a series of jib cranes, supported on pivots se-

MOLDING MACHINES USED FOR MAKING CORES.

POST CRANES FOR SERVING MOLDING MACHINES.



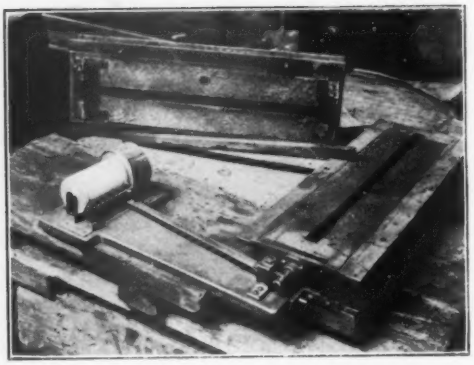
ONE GROUP OF CUPOLAS.

cured to pillars which carry the crane run way. These jib cranes can be picked up by the electric traveling crane and moved from one pillar to another, as conditions on the molding floor change. There are also a number of post jib cranes so arranged that they can swing through an entire circle. Three of these are located at one end of the bay opposite the cupolas to serve some large Tabor molding machines and are equipped with quick acting pneumatic hoists. It will be noticed that the posts are so arranged that the regular traveling cranes pass over the tops of the post cranes, thus giving very efficient service. The central floor of the cleaning department is also served by a traveling crane and several jib cranes arranged along the wall. In the yard at one end of the main foundry building is located a traveling crane serving quite an area for the storage of iron flasks, large castings, etc.

Melting Equipment.

The foundry is provided with 5 cupolas,

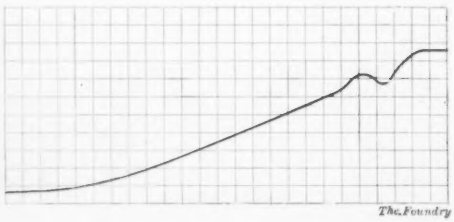
CLEANING DEPARTMENT.



APPARATUS FOR DRAWING THE COOLING CURVE OF A TEST BAR.

arranged in two groups, one of three and another of two. The internal diameters of the cupolas are as follows: 84, 71, 36, 54, and 56 inch. Blast is furnished by positive pressure blowers, which are direct connected to electric motors. The iron mixtures are under direct control of the foundry foreman and chemist. Analysis blocks 2½ by 2½ by 3 inches are cast from each heat or from each mixture, and in addition to this one inch by one inch test bars are cast. As a guide to the physical properties of the iron they use a specially designed rig shown in one of the illustrations, which consists of a mold having a chill at each end so arranged that it will engage the ends of the bar and hold them firmly in position.

A bar one inch square and about 30 inches long is cast between these chills, the main portion of the bar being in an ordinary green sand mold. The expansion and contraction of the bar during cooling is recorded by the device shown, which consists of a pin connected to one of the chills and extending through

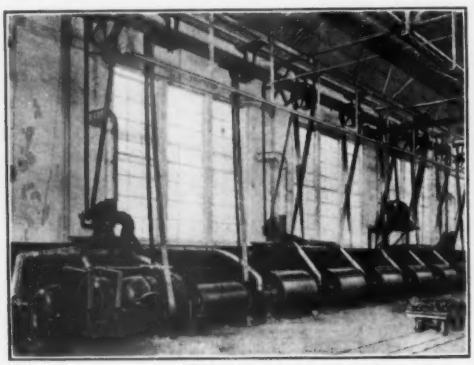


COOLING CURVE OF A TEST BAR.

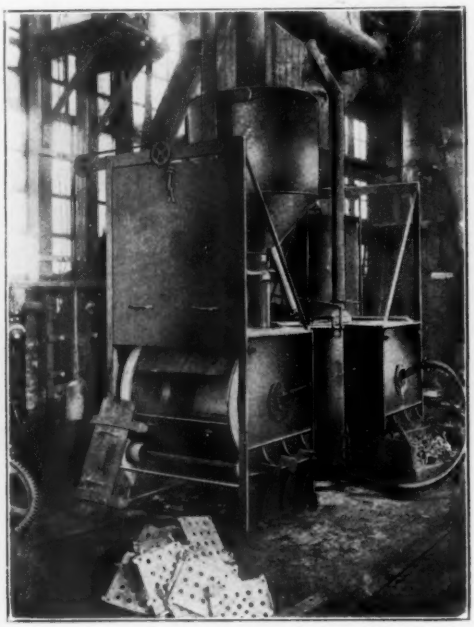
the end of the flask. This engages the short end of a multiplying lever. At the other end of this lever is arranged a pencil which draws a curve upon a drum operated by a small clock. The general character of this curve enables them to determine approximately the analysis of the iron. The bar is subsequently broken on supports about 24 inches apart.

Cleaning Department.

The cleaning department is very fully equipped. Large castings are cleaned under the traveling crane in the central bay of the cleaning department, as shown in the illustration. Smaller castings are cleaned on the side floors of this department or in the sand blast and tumbling departments. They have 9 exhaust tumbling barrels, 2 sand blast tumbling barrels and 3 sand blast rooms, thus providing the proper equipment for all classes of work.



TUMBLING MILLS.

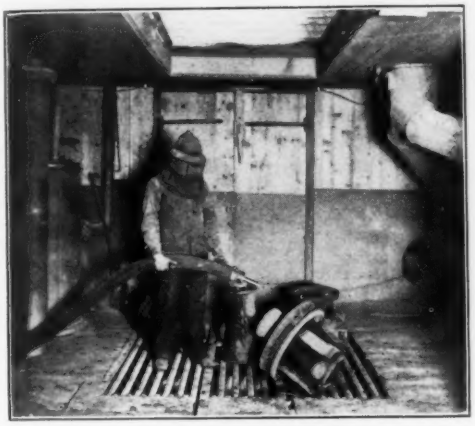


SAND BLAST TUMBLING BARRELS.

Sanitary Arrangements.

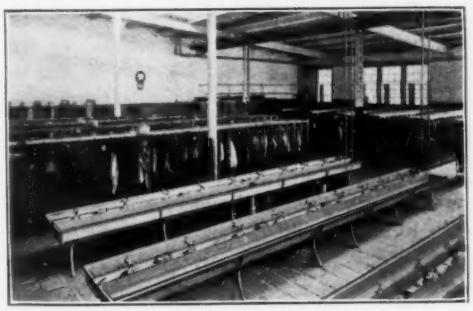
The building is heated and ventilated by two heating and ventilating plants installed by the Buffalo Forge Co., of Buffalo, N. Y., the blowers being driven by electric motors.

Ample provision is also made for artificial light, including arcs for general illumination and incandescent lights for local use.



SAND BLAST ROOM.

The closets, lavatories and lockers are arranged near the center of one side of the foundry. Each man is provided with an individual locker of the expanded metal type. Wash troughs are provided for the general use of the men and in addition to this there are two groups of shower baths which are very exten-



LAVATORIES.

sively used by the men, especially during the summer. The locker rooms are in charge of an attendant at all times.

Storage Buildings.

Behind and beyond the main foundry building are arranged a number of storage buildings, many of which are larger than an ordinary foundry. In these provision is made for storing the coke, pig iron, molding sand, smaller flasks, and other materials required about the foundry. The electric railway system serves to deliver the material from the interior of these buildings to the foundry. In connection with the sand storage arrangement is made for mixing and tempering the sand used.

BRASS FOUNDRY FORMULAS.

The New Era Manufacturing Co., of Kalamazoo, Mich., have issued a leaflet giving 32 practical brass foundry formulas, which will undoubtedly prove of great interest to all brass founders.

The list contains 7 formulas for non oxidable bronze, 7 formulas for aluminum bronze, 7 formulas for phosphor bronze, and 11 formulas for composition bronze.

The non oxidable class of metals are said to be peculiar in the fact that they offer very great resistance to oxidation. It is claimed that a pot of one of these metals can be left exposed to the air in a molten state and allowed to stand and cool without the exposed surface showing any tendency to oxidize. This is probably due to the presence of the phosphorus in the compound and the way in which it is intimately associated with the other metals by the aid of their metallic phosphoro, which is the name given to their new brand of phosphor tin. The non oxidable class of metals vary in color from white to a true gold color. They also vary greatly in tensile strength, degree of hardness, and elastic qualities.

The aluminum bronzes commonly vary in color, and quality, some of them being noted for their great strength.

Each of the formulas for phosphor bronze and composition bronze is prefaced with an explanation of the particular work for which the metal is best adapted. This increases the value of the list very greatly. The above list together with other information on the use of metals will be forwarded on application to the company.

The old established foundry business of Prespey Pero, Worcester, Mass., has been incorporated as the Pero Foundry Co., with a capital stock of $15,000. The officers are: Prespey Pero, president; Prespey Pero, Jr., vice president; Ida G. Pero, secretary and treasurer. These, with Edward Pero, constitute the board of directors.

CORROSION OF METALS.

BY J. F. BUCHANAN.

Metals and mortals have their peculiarities and they possess many qualities in common. Both can be classified according to their affinities, grouped into families according to their characteristics, or ranged in line according to color. They have similar attributes, as hardness, conductivity, luster, etc., they are equally susceptible to treatment, and they are subject to many insidious diseases. Up to the present, however, only a few of the metallic diseases have been diagnosed. Metallic pathology—to coin a phrase and continue the analogy—is still in the chrysalis stage; it is a modern study about which only the most meager, scrappy information is available. The fact that familiar, every-day terms are still employed to denote or describe the diseases of metals, as *fatigue, rust, corrosion,* proves the traditional conception of the subject to be uppermost. In engineering circles there is no more hackneyed subject than the corrosion of metals; it would be difficult, therefore, for me to say anything new thereon. My aim in this article is to bring under review the relative position of the more useful metals and alloys to corrosion; to consider preventives, and to describe some experiences I have had with the plague in the practice of my ordinary vocation—brassfounding.

Corrosion (Latin, *cor*—intensive, *rosus*—to gnaw) may briefly be described as the decomposition of metals by the agency of galvanic or chemical action. In the nature of things corrosion is a problem for electricians, but, while it may be necessary for me to refer to some general principles, I hope by relying on well-known authorities to avoid discussion on electro-technics. And here let it be emphasized that corrosion must not be confounded with another very common affection of metals, viz., oxidation. Oxide or rust may form on the surface of a metal and do it little injury, as, for instance, when zinc is exposed to air and moisture a gray film of sub-oxide is formed which preserves the metal from further oxidation, or when monumental bronzes acquire the desirable *patina*, or colorations due to the production of cuprous-oxide in certain molecular conditions and the beauty of contour or ornamentation is enhanced. Corrosion acts differently. Most of the useful metals have some affinity for oxygen, and are therefore subject to oxidation, but *all* metals are conductors of electricity and they are therefore liable to corrosion under certain well-known conditions. The cause of corrosion is popularly explained by the theory of the galvanic current. Two metals in contact with the presence of moisture form a galvanic couple, and the difference of the force of attraction each metal possesses for electricity causes a current which has been called the electromotive force. Electricity is of two kinds, positive and negative, and it has been found that whatever metals are brought into contact with other, they show, when separated, opposite electrification. The following example will show how the two electricities may be separated from each other by the differing forces of attraction of different metals: "Let us assume that negative electricity is attracted more strongly by copper and positive electricity more strongly by zinc. As long as the two metals do not touch each other the force of attraction is not called upon to act, as the two electricities are equally distributed over the plates. As soon as the metals touch each other, however, equilibrium between the electricities will be disturbed. At the place of contact two different forces are called into action, viz., the force of attraction between the two opposite electricities, and the different forces of attraction of the two metals; and electrical equilibrium is only possible when the resultants of these two forces are equal to each other." That is the Contact Theory briefly stated. Let us now consider the Chemical Theory. When Volta (who was the first to observe that a combination of two liquids and a metal produced a galvanic current) made his discovery, it was also found that greater quantities of electricity are generated by the contact of metals and fluids. This is due to the chemical energy of the elements, the liquids being decomposed by the electrical current. Numerous experiments have shown that all metals become negatively electrified when in contact with alkaline liquids; but in contact with acids different metals behave differently. In the simplest form of galvanic battery where zinc and copper plates are immersed in a solution of sulphuric acid, the chemical process is as follows: Zinc in the presence of sulphuric acid decomposes water into its elements, hydrogen and oxygen. The zinc combines with the oxygen to form zinc oxide, which unites with the sulphuric acid to form zinc sulphate, whilst hydrogen gas escapes at the surface of the copper plate. Negative electricity is produced at the surface of the zinc plate and positive electricity at the copper plate, the po-

tential of copper being higher than that of zinc. It is evident that under different conditions the same metals are sometimes electro-positive and sometimes electro-negative to each other, and as Prof. Sylvanus Thomson states, "If a metal tends to dissolve into a liquid there will be an electro-motive force acting from the metal towards the liquid and vice versa."

The theory of galvanic action, in so far as it relates to metals, may be summed up thus: A current of electricity may be generated by two different metals in contact, by two different metals in the presence of a liquid, or by a combination of two liquids and a metal. Some metals have the property of being positively electrified in contact with other metals, or when submerged in a liquid, whilst others in similar circumstances are negatively electrified, but the polarity of the metals can only be known by experimental electricity or by a comparison of the relative resistances of the elements. The mechanical effect of this motion of the electricities, or current, is the separation of the elements, due to their chemical energy and the difference of electrical potential.

Let us now consider the practical aspect of the subject. Metals are popularly supposed to be stable bodies. Alas, they "perish;" they oxidize; they corrode; the unseen, in the form of gas or electricity, attacks them, and they crumble into powder. The universe is a gigantic laboratory for testing materials. From the recesses of her alchemical storehouse Nature can furnish unlimited reagents to precipitate the last of the elements. No wonder chemists and philosophers tell us "nothing is permanent but change." Attempts have been made to counteract the effects of corrosion, in some cases by neutralizing the electrical potentialities of the metal, and in others by re-establishing electrical equilibrium.

In consequence of the rapid deterioration of iron and steel, hydraulic and mining machine parts and sanitary appliances are preferably made from some material less liable to corrosion. It is unfortunate that iron, the cheapest and most useful and important of all the metals, loses more of its vitality from this cause than any of its rivals. Alloying is said to retard corrosion. Cast iron alloys containing copper and lead have been tried, but with indifferent success; nickel steel stands no better than the ordinary kinds. Certain chemical alloys, as Parson's Manganese Bronze and Dick's Delta Metal, are said to be immune, but it has been found that while they may show no signs of corrosion themselves, they afford no protection to other metals like iron or steel. This is proved in the case of ship's propellers. Zinc plates and linings are just as necessary to prevent corrosion of the hull and aperture when these alloys are used for casting propellers as when the common brass or gun metals are employed.

What led me to look into this matter of the corrosion of metals was an experience I had with a gun metal tail shaft liner. When the ship to which it belonged was put into dry dock, the shaft showed deep corrosion for about three inches away from the junction of brass and iron. The pitting was so bad that the shaft was condemned; a new end had to be forged on, and this necessitated a new brass liner also. The superintending engineer complained about the material we had put into the previous liners, and I was asked if I could not make an alloy which would be indifferent to galvanic action. I smilingly announced to that gentleman that such a metal would be a non-conductor of electricity, and if it were possible for me to produce a novelty of that description, instead of buzzing around the foundry for a living I would probably be enjoying comfortable retirement on the proceeds. The joke passed; and then we fell into a discussion of the probable causes of the corrosion. It transpired that the original shaft had only been two years in use, and for the first eighteen months it had kept in perfect condition. New liners were put on and at the end of another six months when the ship was docked for her half-yearly overhaul, the shaft was condemned because the corrosion reduced the diameter below the limit allowed by Lloyd's surveyors. The engineer had the notion that the alleged gun metal, as he called it, which we had put into the second set of liners was of inferior quality and the sole cause of the corrosion of the shaft. It devolved upon me to assure him that the gun metal was right, and to persuade him that a number of other causes were probably responsible for the trouble. This ship plies upon rivers where there are sandbars and where sheep dips and chemicals used in wool scouring processes find an outlet. During the eighteen months referred to, the great Australian drought, which ended early in 1903, was at its height, the river waters were not so badly polluted as in the six months following the break up of the

drought, therefore the conditions were more favorable to the first set of liners. Further, the original liners were insulated at both ends by having a one-inch ring of Magnolia metal soldered onto the shaft at the junction of brass and iron: this precaution was overlooked when the second pair of liners were put on. I was so thoroughly convinced that some of these other causes were answerable for the corrosion that I had the new liner cast from the same metal as the old one. This incident closed satisfactorily; but that company must always have some kind of insulation for brass and iron in contact under the water line.

Since the introduction of the electric light on board ship there has been a noticeable increase in the number of broken tail-shafts, pitted liners, and corroded apertures. The importance of securing perfect electrical contact in making connections is of more moment on board ship than anywhere else. The loss of a tail-shaft or the bursting of a condenser tube from corrosion may mean a serious loss of life. It is the general practice to interpose some inert, non-corrosive substance between metal and liquid bodies to preserve the former from the destructive influence of corrosion. Thus it is customary to preserve the hulls of ships, or constructural iron work of any kind, by a coat of paint, and tinning is a favorite remedy for preserving metals liable to corrosion, but these things only afford temporary protection. There are so many perplexing causes of corrosion that it would be impossible to find a universal remedy. Ships are liable to be attacked inside as well as outside. Oxidation of sulphur from coal, the presence of metals electro-positive to iron and steel, the existence of moist air in the holds, the possibility of a leakage of the electric current from the dynamo, and other similar agents are ever active. Nickel appears to be less readily corroded than most of the other metals. Prof. Ernest Cohen, Amsterdam, recommends nickel drawn tubes for condensers, and he specifies oxide of copper and nickel as being proof against the corrosive action of sea water and atmospheric air.

An instance came under my notice lately, proving that nickel-plated table ware was superior to silver plating for wear and liability to corrosion. A new mail steamer was furnished with a fine display of E. P. silverware, but some months afterward a greenish, speckled coating began to appear on the surface. The articles were ordered to be replated, this time with nickel, because it was cheaper, and since then they have been giving satisfaction. Much could be written about the relative merits of the various metals and alloys as anti-corrosive substances. Dr. Richards says: "Pure aluminum resists corrosion better than almost any of its alloys." The same might be said of every other metal. Impurities accelerate the corrosion of metals, and it is worthy of mention that the laminations in wrought iron plates, or the spongy places in a casting, are more readily corroded than the homogeneous metal. But oftentimes the casting is blamed for the trouble when some other thing is the cause. Owing to the sulphur used in its preparation, the rubber insertion used in packing valve faces is a fruitful source of corrosion in cast iron steam chests, etc. Pure rubber is costly and the commercial article is loaded with adulterants, especially sulphur. When the corrosion is discovered the engineer whines, "We don't get castings like we did ten or twelve years ago." The fact is engineers are getting better castings, but poorer supplies, with the usual unsatisfactory results. Corrosion is a disease with complications, and the personal equation counts for a great deal in the combat.

DOES IRON EXPAND?

BY JAS. F. WEBB.

In the May *Foundry* there was an article by H. I. on green sand bottoms and sound castings. I want to take exception to some of his so-called theories about iron expanding when cooling. He says if some one had time to experiment with a round ball by ramming it so hard that there would be no expansion to the mold and to try another rammed in the ordinary way that they would be able to settle the question of whether iron expends or sinks in setting. It is not necessary to do any such experimenting as this, for we have examples at hand. For instance, take the case of a car wheel which is cast in solid chill on the outside. If the iron expanded, how would they ever get the casting out of the chill? He mentions a case of castings being poured containing cores, and states that when using the feeding rod the iron came up out of the risers. From this he draws the conclusion that iron expands in cooling. I differ from him on this, for we all know that cores expand in a mold after pouring and until the iron sets, the expanding core will force the fluid metal out of the mold and up through the risers. It is not the iron

expanding that causes this, but the expansion of the core. He says that a large casting will not contract, as much as a small one, and as a reason he states that a loam or dry sand casting cannot expand or swell much and hence will not contract as much as castings made in green sand. The reason for this, according to my way of thinking, is the fact that the softer iron has less shrinkage and when the casting cools slowly in a dry sand or loam mold, the iron is always softer and hence there would naturally be less contraction.

He mentions a casting that he made 14 by 14 by 16 inches into which he did not feed any metal and states that it bored out nice and solid. That might well be, but it is dollars to cents that his iron was poured very dull, or else there was a shrink hole somewhere in that casting which did not happen to be so located that it showed up around the core. I would like to hear from some one else on this subject as to their experience.

PIG IRON WARRANTS SYSTEM AND THE FOUNDRYMAN.*

BY HOWARD M. HOOKER.

In the brief paper prepared for you on the "Warrant System and Its Advantages to the Foundryman," it may not be amiss to give you a brief history of its origin. The pig iron storage system had its origin in Scotland something over 60 years ago, and, as is usual with the beginning of important enterprises, it was born of necessity, history telling us that some furnaceman found it necessary to find a temporary warehouse for some of his pig iron after it had left the point of manufacture. This iron was stored with the Messrs. Connal, lumber dealers, and so frequent was the call on them for storage room from other furnaces that in time they dropped out of the lumber business entirely and devoted their time to the yarding of pig iron. The firm of Connal & Co., Ltd., exists today and yards practically all of the warrant iron in Great Britain. From having a central storage yard at Glasgow, the birthplace of the warrant industry, they have now a yard installed at each furnace, thus eliminating the cost of one handling and some freight.

The history of the industry in this country does not cover so much of a period of time, but with the exception of a few months in 1903, when excessive prices for pig iron ruled, the American Pig Iron Storage Warrant Co. has had iron in its yards since 1889, the year it was organized. Reference is made to 1903, too, for the reason that it is from the conditions under which the consumer suffered during that year that much of the present interest in the introduction of the warrant system is due.

As a simple proposition, the warrant system comprehends the storage of excess pig iron during the times of depression and consequent lack of demand, and puts in such shape that it may be carried for any length of time until the demand exists. In the meantime the iron in warrant is not idle, as we shall presently show. In explanation of the term "warrant": This is a negotiable form of warehouse receipt, setting forth that there has been deposited in one of the company's several yards a certain one hundred tons of pig iron of a certain grade and brand; that upon the surrender of such warrant in the proper manner, they guarrantee to deliver that particular lot of 100 tons of iron free on board cars at their warrant yard. The grade and the weight of the iron is guaranteed by the warrant company, based on its inspection when the warrant was issued.

While it has been shown that these warrants have been issued for a matter of fifteen years, it may seem curious to you that they have never been offered generally to the consumer, although offering the buyer of iron the greatest attractions. Inquiry on this point develops that pig iron in the form of warrants has always been of interest to pipe works and large melters, as it offered them a means of buying a large tonnage at a price somewhat lower than that ruling on actual pig iron; that the delivery of it or its equivalent could be made entirely at their option and not at that of the furnace, thus acting as a safety valve on their iron supply; and, further, that they could in this way cover a contract that involved delivery of finished material covering several years, with perfect ease.

It is in the protective feature that you will find your greatest interest. Many of you have doubtless had the opportunity of figuring on contracts involving pig iron beyond a point that no blast furnace will name a reasonable figure. Usually, beyond a period of six months ahead no blast furnace cares to figure, unless the market is in an inflated condition. The uncertainties as to the future cost of ore, or of coke, or the probable advances in labor, are likely to be offered in justifying this refusal. But let

*Read before the Pittsburg Foundrymen's Association, Tuesday, May 10, 1904.

us assume that you have the same inquiry with the warrant system in general use and warrants on sale where the price is readily determined. You can easily ascertain what warrants will cost for delivery either six months or five years hence, by simply adding to the present price the small carrying charge.

Let us say that you secure the contract mentioned. Your line of procedure is to first purchase warrants, either prompt or future, representing the tonnage involved, or, if you consider it wisdom, only a proportion of same. When the time arrives for your use of the pig iron, you sell your warrants to the extent of the tonnage required. If the market for pig iron has advanced, the price of warrants has also advanced and your profit on the sale of warrants takes care of the advance you are compelled to pay for pig iron. If the warrant market has declined, the difference is absorbed by the lower prices you pay for pig iron. The result in either case, as you will see at once, is to make your pig iron stand you at what it was originally estimated at the time your contract was made. Could anything be more admirable, and could anything be more simple? Bear in mind what your experience has been with sliding-scale contracts, which seemed to slide the other way, and more frequently demanded the services of an arbitrator.

In placing these warrants before the consumer, no attempt has been made to make fine-haired distinctions between brands produced in the same general locality and of practically the same materials. If such a plan were pursued, it might lead to endless complications. The standard classification thus far adopted is as follows:

Class A—Southern coke.
Class B—Northern coke.
Class C—Virginia coke.
Class D—Standard Bessemer.
Class E—Southern charcoal.
Class F—Northern charcoal.

With the increasing growth of warrant yards, there must, of necessity, be other classes added to offset either the point of quality, or to put like irons with the like freights on a Pittsburg basis. Classes A, B and C are subdivided into four grades by analysis and fracture, the grades by fracture being the well known 1, 2, 3, and gray forge. The grades of analysis are as follows:

Grade.	Silicon.	Sulphur.
No. 1	2.75	0.035
No. 2	2.25	0.045
No. 3	1.75	0.055
No. 4	1.25	0.065

these being the standard specifications for foundry pig iron as adopted by the American Foundrymen's Association. The variations allowable under these specifications are those of 10 percent of silicon either way and .01 in sulphur above the standard.

Class D, standard Bessemer, comprehends warrants of the well known limits: Silicon, 1.00 to 2.00 percent; phosphorus, 1.0 and under; sulphur, .05 and under.

Class E, Southern charcoal iron, comprehends warrants covering six grades, from No. 1 to No. 6. Warrants are also issued by analysis in this class.

Class F, Northern charcoal, comprehends warrants based on the accepted standard of Lake Superior charcoal analysis and numbers from No. 1 to No. 7.

For the purpose of putting these warrants before you and the consumer generally in a way that will enable you to know at all times their actual market value and consummate their sale or purchase on a moment's notice, the American Pig Iron Storage Warrant Co. has listed them in the classification just mentioned on the Pittsburg Stock Exchange. Dealers in pig iron all over the country are much interested in the movement and the fact of their co-operation will indicate to you that the plan has most substantial support.

A word or two will not be amiss on the subject of exchange dealings. For the sake of maintaining uniformity, all transactions will be made as of Pittsburg. In the case of coke irons in classes A, B and C, all sales will be made on the basis of No. 2, with a rise of 50 cents per ton for No. 1 and a fall of 50 cents for No. 3 and a fall of 50 cents more for gray forge or No. 4. No one warrant in these classes will call for iron both of fracture and analysis; it will be one or the other.

In closing, permit me to say that the pig iron warrant system does not pretend to supplant the usual method of buying and selling pig iron. It does present a means for your protecting yourselves in a way that no blast furnace can for you.

Alfred F. Morency and Joseph L. Maniere, doing business under the firm name of the Union Brass & Iron Works at Detroit, have sold their plant to the Peerless Heater & Valve Co.

The Murray Co., Dallas, Texas, are planning to add a foundry, machine shop, and several other buildings to their plant.

CRUSH OF THE MOLD.

BY WILLIAM LEARY.

Causes of crush are many and varied, if of the mold it can be readily detected by the shape of the bottom or at the parting lines of casting. Perhaps to make this plainer it will be better to divide crushes into classes. No. 1 remedy will be found to be the antidote for No. 1 crush and so on. No. 1 is a mold crush caused by uneven surfaces at parting lines of pattern or burned out joints of flasks, owing in the first case to a badly torn edge or a drop from the same being patched and standing higher than the rest of the parting, when clamps or weights are applied these prominent places meet, the sand crumbles or crushes as the mold is forced downward, and a waster or scrapped casting is the result. This defect will be found by an ugly lump on the parting line and sand holes either below or above the lump, sand where iron should be, and vice versa. In the case of a badly burned out joint the weight of cope is supported by sand instead of wood or iron, consequently with careless clamping or weighting it is possible to crush a mold, in fact in light work to shut the thickness of metal off with same results as in the first case. No. 2 is what might be termed a bottom crush and can be told at sight by an uneven surface on the bottom side of a casting and can be traced to bottom boards badly bedded or rubbed on the nowel: this effect is noticed also by a series of fins showing where the mold had cracked under clamping or weighting and the metal entering the same and is often mistaken for a swell. No. 3 are generally found on a casting under core prints in a series of irregular lumps or in the case of a flanged casting a thinner flange at the bottom of flange than the pattern calls for, the cause of this is insufficient ramming or neglect to place necessary bearings to sustain the weight of a heavy core or too short a core print, this is an explanation of what is called one of the mysteries of foundry work, when a core known to be under size will yet crush the mold, the damage is not done generally at the time the core is set but when the cope is on and clamps applied, forcing the sand bodily under extreme end of core into the mold. These are the crushers that floor molders in green sand have to contend against but none of them are difficult to overcome if a little horse sense is used.

Now we will turn to snap flask work and what crushes they have to contend with. These may be confined to three causes: the first is insufficient ramming which will cause round castings to be somewhat flat in up and down diameter, the second can be laid to natural causes, wooden slips or binders. Wood as it dries will shrink and it is quite possible at the beginning of a heat to use a slip on the last molds made successfully yet crushing molds before the ending, owing to the first made molds standing in the air and heat and by so doing getting harder, at the same time the slip if new is getting smaller. This will in a measure excuse bench molders crushing work by slips they had used successfully the day before. Another cause may be traced to the practice of some molders putting weights too light for their work on as they call it "heavy," this means dropping the weight on a mold from a height of 1 or 2 inches with more or less force, a doubtful way of overcoming a strain but very productive of scrap.

Remedies.

No. 1. In the case of a torn joint, etc., care must be taken to have all patches sleeked or cut off a trifle lower than the rest of the parting, bearing in mind the old proverb, "a fin is better than a crush." No. 2. This can easily be got over by cutting off rammed sand standing above flask with straight edge, then by riddling on a little sand and drawing straight edge over the same raised up to a height of ⅛ of an inch above the edge of the nowel, before placing the bottom board. This practice is good for molds of large area when flask is in good condition, otherwise it will be necessary before clamping to push wooden wedges between bottom board and flask just under where toe of clamp will come, this will be found to be yielding enough to insure safe clamping yet stout enough to resist tendency of the bottom board to force up the center of the mold. The same remedy will answer in the case of burned out joints. No. 3. This is the easiest one to overcome; if core prints are too short make core and prints longer. Any job over 8 inches diameter is safer with a bearing under the core than without and it does not pay to throw any chances away in molding so be sure to have the longest and widest bearing you may have room for. Also do not forget to clay-wash the bearing on the side next to the pattern to avoid what is as bad as a crush, viz., a cut or wash of sand. On lighter work or say when a core does not exceed 100 lbs., intelligent ramming will be support enough.

For snap flask work: First, ram around patterns hard enough to sustain weight heavy

enough to stop straining. Second. In place of wooden slips use bands made of cast iron and insert in flask before proceeding to ram or if mold would be too heavy use iron slips which can be made easily and cheaply and will last a life-time with care. These do not find much favor with foundry men as a rule because it is very hard to get two alike owing to different shrinkages, but if sides and ends are made separately this can be overcome and in my opinion would be far superior and cheaper in every way, of course they will retain more or less heat but if two holes are cast in either end it is an easy matter to attach wooden handles. Third. See that molders are supplied with weights sufficiently large to cover all of the top surface of mold heavy enough to withstand head pressure then there will be no necessity for heavy weighting (so called) they should also be true or planed on under side, if otherwise, damage is done in the shape of a crush or run-out or a strain.

POINTS FOR BRASS FOUNDERS.

BY A PRACTICAL TRAVELING MAN.

Appearance is the most essential factor in the introduction and sale of goods. It may not be the wisest thing to say at this day, when so many large establishments employing (seemingly), the very best talent to be secured in their various departments, that so large an amount of ignorance exists regarding the actual quality of the goods in use, but such is the case nevertheless. Just why, it is hard to explain, except that the knowledge is obtained upon theories and not upon actual facts.

Let me illustrate: Not long ago it was my pleasure to sell a very large order of yellow ingot brass to an establishment employing this very best talent in the department using the material. The brass was delivered and after using, or rather abusing, several heats, having bad results in the castings, the metal was forthwith returned with the instructions to replace same with good metal, as per agreement. When interviewed regarding the matter, the talented brain powers' reply was "It looked too dark on top. There was something else in it beside brass." The order was duplicated at once with the same class of goods, only with instructions to see that all future orders made for these people must be poured into the molds very cold, causing rapid freezing and thus changing the dark to a light appearance. The customer was well pleased, and no more bad castings resulted. So much for appearances.

Now, may good brother foundryman, as you are manufacturing goods for sale and not simply to adorn stock room shelves, be very particular and have your goods look nice. It matters not what you make, from the bar of ½ and ½ solder to the ingot of phosphor bronze. Of course a large amount of deception can be practiced and still maintain the general appearance of the goods. Take as an instance the solder above mentioned. Now, this is a branch of the business requiring the very closest figuring, owing to the large consumption. To use just equal parts of new pig tin and lead and expect to be able to compete would be out of the question. Scrap must be resorted to. Old tin pipe, tin foil, lead foil and solder joints are valuable material to the solder maker, as each has its tin content. They must first be refined, the analysis of the pot taken, and the required amount of pig tin added to raise the percentage to ½ and ½. Now for appearance, especially since this metal is largely judged by its looks. Have a brass mold made and finished perfectly smooth, with the proper name thereon. Then have a water flush so that the mold is kept constantly chilled. Solder in pouring so as to have a fine face must not be poured very hot, just enough to fill the bar properly, as the rapid chilling enables the bar to set with its bright face, by which it is judged. By using only 45 parts tin, 52 parts lead and three parts antimony you can make a bar of solder look just like the goods (so often expressed), if you do it right. Have the lead and tin ready, melt the antimony separately and when ready to pour have it poured into the caldron so as not to mix thoroughly but remain upon the upper surface. Then by the skill of the ladle manipulator, a bar of solder is produced that looks like the real thing. It is unjust competition, but one of the things that we have to cope with. Knowledge of the use of old metals is by far the better way to compete, and the most profitable to maker and user.

Babbitt and anti-friction metals come under the same form of making. Some grades require a coarse grain, others a fine grain, only because they are judged by their appearance, and it may be said unhesitatingly that not one-half of the people who are buying and using Babbitt or Anti-friction metal know what they get. Let me illustrate this. A large amount of so-called copper hardened Babbitt claiming to contain from 3 to 5 per cent of copper is sold, which in reality contains no copper whatever.

It is all done in the pouring, that the beautiful copper color comes to the surface. Antimony, the vermilion color maker and heat do the act. Take 50 parts tin, 36 parts lead, 14 parts antimony. Melt tin and lead together. Melt antimony separate, pour together under good heat. Pour into bars at a cherry red color, and you will produce a copper hardened Babbitt, minus the copper, yet has the appearance. Another way to produce a like result and at a less cost is to use 50 parts pig tin and 50 parts antimonial lead. Pour at a red heat. Now without the use of any copper this makes a very good quality of anti-friction metal and one that is well adapted to most all classes of work. It might well be stated here that antimonial lead alone is a very good anti-friction metal, and one that is largely sold bearing fancy names and commanding high prices.

Before leaving let me mention still another point that will be interesting. Pouring an ingot of phosphor bronze so as to present a good appearance. Have clean cast iron molds. Do not finish the castings, as the skin of the iron will act as a protection against crazing and breaking, and insure longer duration, also prevent the bronze from burning fast to the iron. When ready to pour the metal put a small quantity of common crude oil in each mold and fill the molds up to within one-half inch from the top and then put a cap over the burning mold immediately. This prevents any oxygen striking the metal during the process of solidifying and a perfectly smooth surface is the result. This same process can be used on all grades of metals with the same results. But custom has decreed differently with red or yellow ingot unless the rough surfaces are visible. Then genuineness may be questioned. After all, appearance is what sells your goods, —so keep up to date. Will see you soon again.

A NEW FACING COMPOUND.

Founders making small brass and bronze castings in which sharp outlines must be obtained use large amounts of lycopodium as a dusting or facing powder. This powder really consists of the seeds of a species of club moss and hence the supply is limited and the price always high. It is odorless and tasteless and floats on water, even though the water does not wet it. It also burns very quickly when thrown on a flame. These last two characteristics render it especially valuable as a facing powder.

In applying lycopodium to the face of a mold, the surface of the mold is first moistened so as to cause the facing powder to adhere and produce a smooth surface. The characteristics of lycopodium may be illustrated by the following experiments: Dust some lycopodium over the surface of a glass of water and then dip the finger well into the glass. Upon withdrawing the finger you will notice a fine, delicate coating remains, which to the touch is perfectly dry. Now, with the finger perfectly dry introduce it into the dry powder, and upon withdrawing it you will notice that no such coating remains and that only a small amount of the powder adheres to the finer folds of the skin. These tests are used by buyers of lycopodium, which, on account of its high price, is frequently adulterated by unscrupulous dealers with pine-pollen, starch, sand, etc.

When using lycopodium as a facing powder, it is necessary to moisten the surface of the mold before applying the powder. This is usually accomplished by wetting the face of the pattern. This continual moistening of the pattern, if it be of wood or plaster, is sure to injure it in time. And if the pattern be of metal, the moistening process still takes a considerable amount of time.

A new compound called lycodin has recently been patented in Germany and the United States and introduced on the market to take the place of lycopodium as a facing powder. It is claimed that it makes a parting in every way equal to that produced by lycopodium and, in addition, that a given weight of it will cover one-third more surface.

Two characteristics distinguish lycodin from lycopodium; first, it is lighter in color, being more of a grayish tint. Second, it is very much cheaper in price. When lycodin is submitted to the water test already described, it behaves exactly like lycopodium. Another great advantage of lycodin is that it can be applied without moisture.

Mr. S. O. Bishop has sold a two-thirds interest in the Brodhead Foundry of Brodhead, Wisconsin, to Messrs. W. J. Voorman, of Janesville, and John A. Butcher, of Milwaukee, and the plant is being remodeled and put in good shape for business.

The Rigby-Clove Foundry Co., of Pendleton, Ore., who held an option on the plant of the Mays & Zeigler Foundry Co., have released their option and the plant has returned to the old management, who now expect to improve the plant at once.

THE FOUNDRY.

PUBLISHED MONTHLY BY

THE IRON AND STEEL PRESS CO.

1060-1068 ROSE BLDG., CLEVELAND, OHIO.

G. H. GARDNER, PRESIDENT AND TREASURER.
JOHN A. PENTON, VICE-PRESIDENT.
A. I. FINDLEY, SECRETARY.

HENRY M. LANE. - - - - - - - - Editor.

CHICAGO: 1164 Monadnock Blk., GEO. H. GRIFFITHS.
PITTSBURG: 429 Park Bldg., A. O. BACKERT.
NEW YORK: 150 Nassau St., D. C. WARREN.
THE CENTRAL WEST: R. A. EVANS.

The subscription price of THE FOUNDRY is $1.00 a year to points in the United States, Canada and Mexico. To Great Britain: Eight Shillings. Single Copies 10 cents.

Practical articles pertaining to the trade in all its branches are solicited and will be paid for.

Entered as second-class matter at the Post-Office at Cleveland, Ohio.

TRADE OUTLOOK.

During the past month the iron market has been in an unsettled condition. Despite the fact that spring is well advanced and a general resumption of business might be looked for, there has been a marked decline in the price of pig iron and very little activity in the foundry business in general. Some of the stacks which were blown in during the early part of the year have been blown out, and more are to follow, so that pig iron production will probably be curtailed considerably during the next few months. Last month Southern No. 2 foundry was selling at $10 with some furnaces holding for higher figures, but at present $9.25 seems to be the ruling price and it is probable that on desirable business and large tonnage a lower figure could be obtained. In the North No. 2 foundry is held at $12 per ton at the furnace. It is now past the middle of the second quarter, but very few orders have been placed for the third and foundrymen seem to be buying to cover their immediate needs only.

The contractors for the Pennsylvania tunnel asked for bids on 52,000 tons of castings for lining the tunnel and 12,000 tons of castings for screw piles. It is stated that the Wheeling Mold & Foundry Co., of Wheeling, W. Va., secured one-half of each and they are now inquiring for pig iron to cover the orders. At first it was reported that the New York Car Wheel Co., of Buffalo, N. Y., had secured the other half of the contract, but no confirmation of this has been received, and it is stated that the Wheeling people have given the contractors an option on the second half or any portion thereof, at their bid for the first half. Deliveries for these castings do not begin until 1905. The pipe foundries are fairly busy and 30,000 tons of pipe for Cincinnati for which bids have been opened, are soon to be awarded.

As mentioned last month, the molders and the foundrymen failed to come to an understanding in regard to a national agreement, and thus far local agreements have not been entered into in any of the foundry centers where they have expired.

The noteworthy fact about the situation is the continued heavy consumption of pig iron. In April this appeared to be at the rate of close to 19,000,000 tons a year. This is surprising in view of the number of unemployed men in the metal-working trades.

Meeting of the American Foundrymen's Association.

As previously mentioned, the meeting of the American Foundrymen's Association will take place in Indianapolis, June 7th, 8th and 9th. An elaborate programme has been arranged, and judging from present indications, this will be one of the most profitable meetings the Association has yet held. The provisional programme is printed in another part of the paper, and we hope that there will be a large attendance of both foundrymen and patternmakers.

Foundry Exhibit at St. Louis.

We are glad to learn that the foundry building and foundry exhibit at the World's Fair have not been abandoned as stated in our last issue of *The Foundry*, but that, on the contrary, the building is now under construction and exhibits are being prepared for installation on a scale that will be creditable alike to the exposition and to the industry. The subscriptions for the foundry building have not been called for, owing to the fact that the exposition management decided to erect the building instead of asking the foundrymen to do this.

The delay in opening the building will not, after all, be a serious matter in view of the fact that, as shown by the experience at both Paris and Chicago, nine-tenths of the visitors will come to the exposition during the last four or five months of its season. We trust that all foundrymen will co-operate with the exposition management, and thus show their appreciation of the effort being made to provide for them an instructive and comfortable headquarters, when they visit St. Louis.

The Use of Cast Iron Borings.

Considerable discussion has taken place recently upon the use of cast iron borings in the cupola. As a consequence the editor directed letters to a number of persons who he knew had had experience along this line to obtain a statement as to their experience. The most instructive of these answers was received from Mr. A. E. Outerbridge, Jr., of Philadelphia, and is printed elsewhere.

Summer School for Artisans.

During the three past summers the University of Wisconsin has maintained a summer school for artisans and we have received an announcement that it is their intention to hold such a session during the coming summer. The session opens June 27th and continues for six weeks. The previous sessions have been very well patronized, showing that a large number are glad to take advantage of such opportunities. The instruction is given by members of the regular college faculty, and all the extensive laboratories and shops of the University are at the disposal of the students for laboratory work. Courses are given in steam engineering, applied electricity, machine design, materials of construction, shop work, and surveying.

The school has a double object; first those who wish to attend college are allowed to do their laboratory or shop work in this period, thus shortening the time which they must remain at college, or allowing them to take additional studies during the regular college year. Second, the school is intended for the benefit of those who are employed in some of the trades or engineering branches and so situated that they cannot take the regular college courses. In many cases, such persons can arrange for a six weeks' vacation to be spent in study at the school.

We notice that both foundry work and patternmaking are among the subjects assigned in the shop work division. It is said that the entire expense for the six weeks' term, including living and school expenses, may be fairly estimated at $50.00, this amount not including transportation.

Fluorine.

In another part of the paper we publish a kick which we cannot help but appreciate, and cannot help but feel that the writer has some ground for complaint. It certainly seems as though it would be wise for the makers of foundry supplies to select names which are not confusing and which, so far as possible, state what the article is intended for.

THE USE OF CAST IRON BORINGS.

BY A. E. OUTERBRIDGE JR.

While I have had considerable experience during more than twenty years in this matter, I am not prepared to write an article of a favorable nature, neither do I wish wholly to condemn the practice. In former years it was customary for quite a number of foundries to cast each day several pots from over iron, molded by apprentices, in which borings were packed. These pots were then charged as scrap and gave little trouble. It was found, however, that the cost of the pots exceeded the supposed gain in melting the turnings and the practice was given up. About 1872 the late Geo. Whitney, of the firm of A. Whitney & Sons, car wheel manufacturers of Philadelphia, obtained a patent for melting cast iron turnings in wooden boxes, he having found by experiments, that the boxes (made of hemlock) were very much cheaper than the cast iron pots and, contrary to the general expectation at the time, showed no tendency to consume when charged into a cupola, even toward the end of a heat when the entire mass of iron and fuel was incandescent, on account of the fact that carbonic acid gas is always present in the upper zone and prevents combustion of the inflammable wood until the burden descends to the melting point which is but a short distance above the tuyeres. By that time the contents of the box are in a plastic state and ready to melt. The wood, which has become charred, then burns, adding its quota to the fuel.

This process was used continuously in the foundry of A. Whitney & Sons during many years while I was with them, in fact I believe until the concern passed out of existence and the plant was demolished. The borings were car wheel iron, obtained from boring the hubs of the wheels, and, if my recollection is correct, averaged about 5 per cent of the melting each day. There was no appreciable loss in melting traceable to this comparatively small amount of turnings, but there was an increase in the depth of the chill of the mixture observable wherever the borings were melted. In 1887 I severed my connection with the firm of A. Whitney & Sons and accepted a position as metallurgist with William Sellers & Co., incorporated, and I introduced the Whitney process in

their foundry. Before adopting the method we made many tests, even going so far as to melt 160 boxes holding about 100 pounds of borings and turnings each in a cupola without any other material except one ton of pig iron placed upon the bed.

The blast was reduced to about one-half of the usual pressure, and the metal from the spout was all cast iron pigs. These pigs were cleaned from adhering sand, the sculls, drippings, cinder mill shot, etc., gathered up and weighed. The recovered metal weighed a little over 90 per cent of the charged metal.

There was undoubtedly some increased loss in melting, though not sufficient to be of serious consequence or even to show on the monthly records, but the roof of the foundry became covered in time with a brown stain or powder, due to the iron rust which we traced to the escape of fine particles of heated iron from the stack. Whenever a box was broken by the impact of pig iron falling upon it as sometimes happened, allowing the chips to fall out, there was a cloud of iron particles visible at the top of the stack. Then too, the escape of loose chips of cast iron into the cupola be-

Special Melt of Cast Iron Turnings and Borings.

Date of Heat, *Sept. 9th,* 1903. Size of Bars, 1″ sq., 15″ long. Distance between Supports 12″.

WM. SELLERS & CO., INCORPORATED, per *A. E. O.* Cupola No. *1*

TEST.	BREAKING STRAIN.			DEFLECTION.			RESILIENCE.			FLUIDITY TEST.	SHRINKAGE IN TOTAL LENGTH.	FRACTURES.
	A	B	Mean	A	B	Mean	A	B	Mean			
1 First of Heat	2625	2820	2723	.110″	.126″	.118″	.48.07″	.59.22″	53.64	9″ 9″	.231″ .236″	Close
2 Middle of Heat	2780	2875	2828	.118″	.127″	.122″	.54 61″	.60.70″	57.66	7⅜″ 7¾″	.220″ .228″	"
3 Last of Heat Exp.	2855	2825	2840	.119″	.113″	.116″	.56.55″	.53.14″	54.85	6¾″ 6⅞″	.225″ .226″	"

Total number of boxes charged	135	
" weight of metal charged	30395	lbs.
" " " coal charged	4200	"
Pounds of iron melted to 1 lb. fuel	7.21	"
Total weight of iron recovered	27797	"
Per cent. metal recovered	91.4	"

Test bars were cast as usual from beginning, middle and end of heat. Drilling taken from fractured pieces of six test bars gave 1.40% silicon.

The following castings were made of this metal:

Saddle No. 11 for 60 inch Slotter	620	lbs.
Center Post No. 10, 47 foot Turn Table	1590	"
Four Counterweights	22840	"
Test Bars and Test Castings, Scrap and Foundry Pig	2747	"
Total	27797	"

The metal from the spout was hot and fluid to the end, good grey iron with fine grain, samples cast in sand against heavy iron chill block showed ¼ in. to ½ in. chill on 2 in. section. No sparks were observed at the top of the chimney and not more than usual at the spout.

The pigs cast in sand were perfectly white and contained about ½ of 1 per cent of silicon, though the borings were soft iron averaging over two percent silicon.

At that time the average cost of No. 1 foundry iron at Philadelphia was about $21 per ton and of No. 2 about $20 per ton. Both grades were used in about equal proportions. The marketable value of the cast iron chips was abut $10 per ton and the cost of the boxes, including the materials and labor, $3.60 per ton of borings packed. For several years we charged all of the cast iron chips we made in the machine shop in boxes in the cupolas.

fore reaching the melting zone caused a rapid and excessive formation of slag, due to the oxidation of the finely divided iron as it fell through the burden and was attacked by the blast. This caused an increase of back pressure and occasional blow holes were found in the castings, which were attributed to these causes. In 1892 the price of pig iron had fallen about 25 per cent, while the price of lumber and labor had increased, and I came to the conclusion that there was no longer any advantage to be gained in melting cast iron borings in wooden boxes, and therefore discontinued it. In the late boom period when the price of iron

had increased abnormally, I took up the question again, having now found a means of making cast iron boxes from over pig at a low cost. The boxes with cast iron tops weighed about 170 pounds each and held 100 pounds of borings each.

As in the former tests we made experimental melts in the cupola, charging the packed boxes only, omitting even the ton of pig on the bed. I include herewith a copy of one of our statements, showing the result of melting 135 boxes of turnings without any other material and also a section cut from test bar, B, from the first of the heat, which gave a good strength record, that is, 2,820 pounds transverse breaking strain on a bar one inch square section, with supports 12 inches apart.

Note: The section referred to shows a close grain, such as would be expected from good gray iron intended for machinery castings. Editor.

The tensile strength was about ten times the transverse strength or 28,000 pounds per square inch. Several good castings were made from this metal. The metal was fine grained, dense, and of a light color, though it was not hard. The cost of making the cast iron box was much less than the cost of making a wooden box, but as we did not make sufficient over iron to cast all the boxes required it was necessary to melt some iron for this purpose, which of course increased the expense somewhat. At present I am not using any cast iron borings, and do not expect to resume the practice unless the price of pig iron soars upward once more.

From a metallurgical point of view, the melting of cast iron borings, either in wooden or cast iron boxes, or pressed into briquettes with a binder such as pitch, or other suitable carbonaceous material (as I have done experimentally) is open to criticism, in my judgment. To be successful it is necessary to insure perfect protection of all the chips in their passage from the charging door to the melting zone, and this is exceedingly difficult to accomplish. One broken box in a heat will cause much damage to the fluid metal, and for this reason I am not an enthusiastic advocate of melting cast iron borings with pig iron in a cupola for any purpose except sash weights, counter weights or other castings of a like nature, where hidden flaws do not injure the casting.

The W. G. Powell Brass Foundry & Mfg. Co., of Bridgeport, Conn., has filed a certificate or organization.

GATING A MALLEABLE CASTING.

BY H. KAROW.

The pattern for two malleable castings, together with the gates, is shown in Fig. 1. These castings were about 14 inches long. The gate is located at A and the runners pass to the two shrink heads B and thence to the castings at E and I. This casting had to stand heavy shocks and was made thick at the point D, but persisted in breaking at this point and the chemist was blamed for it. Nobody could find fault with the molding, for it seemed to be perfect, but when the casting was broken anywhere between F and G the outer part of the metal would look all right and the center would shown dark gray, with a coarse open structure. After some experimenting I changed the gates at B and E, making the gate at E narrower, but thicker, in order to keep it hot longer and to increase this effect I added the block B in the cope and the block H in the drag as shown in the cross section

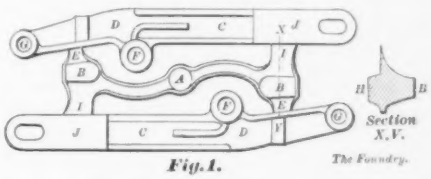


Fig. 1.

taken on the line X-Y. Before the block H was placed in the drag the iron in the gate E cooled too soon and hence did not make up for shrinkage in the portion of the casting between F and G, but after introducing the above blocks D and H and changing the form of the gate E the casting at the point D would become solid before the blocks B and H and hence all shrinkage occurred in these blocks.

The casting at the point J is so light that it needs no shrinker and therefore the gate I is only 5-64 of an inch thick, but at E the gate is 7-32 of an inch thick. Very light or thin malleable iron castings require no shrinker, though a little block is frequently introduced into the runner on the cope side to catch any impurities and hold them away from the casting proper, but in heavy malleable iron work, shrinkers are very necessary.

The Lieberman & Sanford Co., of New York, have been incorporated with a capital of $15,000 to manufacture iron and brass goods. The incorporators are: S. Lieberman, C. F. Sanford and H. Graf, of New York City.

LIFT OF CORE AND COPE.

BY W. W. BIRD.

The question of how much it takes to hold down a cope or secure a core, has always been more or less of a problem in foundry work, and experience seems to be the best authority on the subject.

Experience, however, sometimes teaches foresight as well as hindsight, and on this account it is often possible to tell what the forces are to be, that is within reasonable limits.

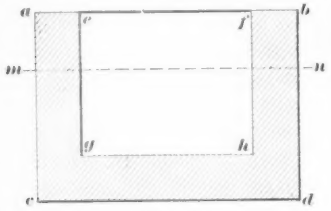


Fig. 1

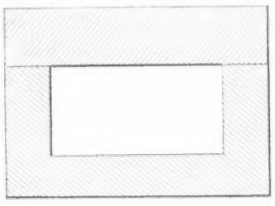


Fig. 2

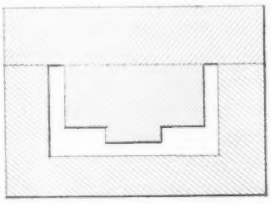


Fig. 3

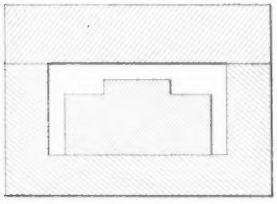


Fig. 4

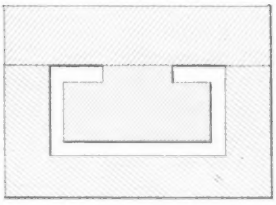


Fig. 5

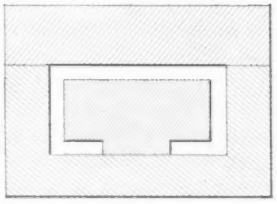


Fig. 6

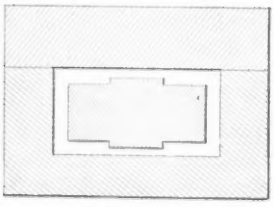


Fig. 7

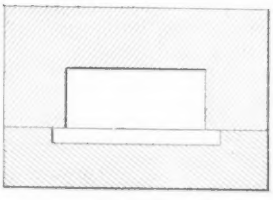


Fig. 8

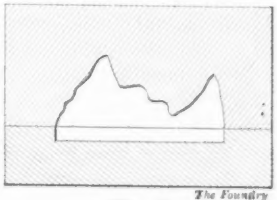


Fig. 9

It is not the object of this article to explain the natural laws which govern the forces at work, but rather to show their application to the problem of anticipating conditions. As long as the iron is in a molten state the forces exerted by it follow the general laws of liquids, two of which are that the intensity of the pressure exerted by a given liquid at any point varies directly as the distance from that point to the free surface and that a solid placed in the liquid is buoyed up by a force equal to the weight of the liquid displaced. A full explanation of these laws can be found in any book on physics.

In order to simplify calculations, four cubic inches of cast iron will be taken as weighing one pound, that is a column one inch square and four inches high will weigh one pound. If more accurate results are needed, .26 pounds per cubic inch should be used.

In Fig. 1 let *a b d c* be a flask; *m n* a parting line and *e f h g* an opening 12 inches square and 10 inches deep, 4 inches above the parting and 6 inches below. Let us assume that this opening is filled with molten iron, 360 pounds being required, 216 below parting and 144 above.

In Fig. 2 all dimensions remain the same. We have sand in place of iron above the parting, or, in other words, we have a mold with a four-inch cope. The pressure up must be equal to the weight of the iron displaced, or 144 pounds. By the other law the pressure at the parting would be one pound per square inch, and as there are 144 square inches on the cope the total must be 144 pounds.

For a plane cope we have then that the lift is equal to one-quarter of the area of the opening in inches, multiplied by the depth of the cope or the distance to the free surface of the iron in the gate.

In Fig. 3 we have a mold with all dimen-

sions the same except a core 10 inches square and 4 inches deep with a projection 4 inches square and 1 inch deep, which bears on the cope. How much force is required to hold each part?

By the law of displacement we have 104 pounds for the core and 144 for the sand in the cope over the opening, or 248 pounds total. By the law of pressures we have the pressure on 16 square inches at the lowest part of core of 2¼ pounds per square inch, or 36 pounds. A pressure of 2 pounds per square inch at the next level, which has 100—16, or 84 square inches, making 168 pounds. At the parting there are 144—100=44 square inches at 1 pound pressure, or 44 pounds. 36+168=204 on the core and 44 on the cope, or a total of 248 pounds, the same as before.

In Fig. 4 we have everything the same excepting the core, which is turned over and rests on the bottom of the mold. In this case there is no lift to the core provided the iron does not get under it. The lift on the cope is the same as in Fig. 2, 144 pounds.

In Fig. 5 the core is against the cope, as in Fig. 3, only the core is turned over. Here the displacement is just the same as in Fig. 3, and therefore the total lift is 248 pounds. On the cope proper we have 144—16=128 square inches at the parting, or 128 pounds as the pressure is 1 pound per square inch. At the bottom of the core the pressure is 2¼ pounds per square inch and there are 100 square inches or 225 pounds. At the middle level there are 100—16=84 square inches and a pressure down of 1¼ pounds per square inch or 105 pounds. 225—105 gives a net upward pressure or lift of core equal to 120 pounds. A total of 128 on the cope plus 120 on the core = 248, the same as before.

In Fig. 6 the core is on the bottom of the mold instead of against the cope, as in Fig. 3. Here the lift on the cope is 144 pounds, the same as in Fig. 2. There is a downward pressure on the core of 1¼ pounds per square inch on 100 square inches or 125 pounds and an upward pressure of 2¼ pounds per square inch on 100—16=84 square inches or 189 pounds. A net lift on the core of 64 pounds, provided the iron does not get under the bottom of the core.

In Fig. 7 the core is in the middle of the mold. Here the lift on the cope is 144 pounds and the core displaces 416 cubic inches or 104 pounds of iron, making a total lift of 248 pounds, the same as in Figs. 3 and 5. This shows that the total lift does not change with different positions of the core provided the displacement remains the same and is equal in all cases to the weight of the iron displaced by the core and the sand in the cope over the cross section at the parting. If the cross section is larger below the parting there will be an additional lift, while if the iron goes into the cope there will be a less lift, by an amount equal to the weight of that iron.

In Fig. 8 let the cope be 8 inches deep, the lower part of the mold 12 inches square, in the cope a section 10 inches square and 4 inches high. By the rule the lift would be that for a plane cope minus the weight of iron in the cope and in this case is one-quarter the area of the opening multiplied by the depth of the cope or $144 \div 4 \times 8 = 288$ pounds, less the weight in the cope of 100 pounds, making the lift 188 pounds. By pressures we have at the parting 2 pounds per square inch and 144—100 = 44 square inches, making 88 pounds; at the top of the mold the pressure is 1 pound and there are 100 square inches or 100 pounds. This gives us 88+100=188 for the lift on the cope, the same as by the rule above.

In Fig. 9 we have an irregular outline in the cope, the depth of the cope and area at the parting being the same as in Fig. 8. In this case pressures and areas vary so much that it would be almost impossible to get the total upward pressure or lift, but if we know the weight of the iron in the cope we can find it by our rule. For example, in this case let us assume that the casting above the parting will weigh 50 pounds, then the lift is 288—50=238 pounds.

In all of the examples we have not taken into account the weight of the cope itself nor of the core, both of which decrease the lift, and on the other hand we have not considered the momentum of the fluid iron when the mold is full, which tends to increase the lift. These should be considered in large work, but in ordinary practice it is safe to consider that one will balance the other.

In conclusion we have the total lift of core and cope is equal to whatever weight of iron we must displace by either core or cope to bring the mold from the opening condition of Fig. 1 to the desired form.

The plant of the United States Cast Iron Pipe & Foundry Co. at West Superior, Wis., has resumed operations after a shutdown during the winter months.

REVIEWS.

Pickling Castings.

Stahl und Eisen, March 15. Mr. J. L. Eckelt describes his method of using acid water for pickling castings, in place of using the scratch brush. The plan is to have stone tables covered with sheet lead, pump the acid water into an overhead tank, from which it descends upon the castings in the form of a fine spray, this also taking place from several sides so that all portions of the work are covered. The surplus acid-water collects into a sunken vat to be pumped up again. After the castings have been sufficiently acted upon, they are left stand say 48 hours, or as long as it may be necessary, until the sand comes off easily when the work is washed with clear water. After thorough rinsing the castings are removed and left stand a further two days in the air, when they will be coated with an even layer of brown. We over here would hate to give the castings all this time, unless the foundry is way ahead of the machine shop. The advantages claimed are in labor saving, tools, clean and smooth surfaces, and no breakage. Figures are further given to show the economy of the process, which indicate 67 percent benefit over hand cleaning. Our conditions and prices would, however, require the figures given to be taken with due allowances. The process is, unfortunately, not compared with the tumbling barrel.

Permanent Molds.

Stahl und Eisen, March 15, comments on Mr. Murphy s recent paper on the above subject, and holds that this matter of permanent molds is pretty well known in Germany. A description of the permanent molds for annealing pots for wire mills is also given which may be of interest. On a cast iron plate for a foundation there is erected a shell of 13-inch brick, sufficiently open to allow the gases to escape. Another cast iron plate on top of this brickwork is bolted to the bottom plate. The brickwork is now covered with one and one-half inch of very refractory loam, sweeps being used to finish up to the proper diameter. The core consists of a cast iron plate which fits into the cover of the brickwork. To this core plate is riveted a perforated steel shell which has been first shrunk on it while hot. This structure is provided with suitable trunnions, and after claying up a little is covered with straw or excelsior rope. Loam is now swept on just as is done in making pipe cores. Before the loam is dry about ten short U-shaped iron rods are pressed into and through it, extending also through the perforations of the shell, and the protruding ends are wired together, thus holding the loam very securely to the form. After drying, the last coat of loam is swept up, the core dried and blackened. It is now dropped into the mold and suitably secured. Openings are provided in the top plate for pouring gates. But little damage is done the mold when poured, and about fifteen castings can be made with but little repairs to the mold surfaces.

A Pouring Carriage for the Foundry.

Giesserei-Zeitung, March 15. The Benrath Machine Co. has gotten up a very substantially constructed carriage to convey a ladle full of iron in the foundry to the molds. It is run by trolley on heavy surface tracks. The girder, with the ladle at one end and the hydraulic machinery at the other, swings about the central vertical shaft as an axis. The hydraulic machinery raises and lowers the girder with the ladle sufficiently for pouring purposes, this being at the same time tilted. The ladle holds 20 tons, and the total weight of the machine is about 100 tons. For works which desire to do heavy casting and have no overhead crane system, or where the iron is gotten from another shop, this may be an excellent device. We, over here, rather prefer the electric overhead traveler to an automobile carrying arrangement.

The Baby-Bessemer Process Fever.

Giesserei-Zeitung, April 15, brings out an interesting article on the run the so-called Baby-Bessemer processes are having in Europe at the present time. This "spook" is now apparent everywhere in Germany, to the intense disgust of existing steel casting plants whose prices are cut to pieces by the resulting fierce competition. Mr. A. Zenzes, who writes the article, holds that if the principles of the Bessemer process, as developed from the operation of the standard works for steel-making, were applied by the people building the small plants in question, they would avoid the pitfalls now open before most of them, and their ventures would prove successful. They usually fail in one or more of the numerous auxiliary processes which are the neces-

sary accompaniment of the making of the steel itself. Looking over the numerous prospectuses of the builders of Baby-Bessemer works there will be found claims for the process which are simply astonishing. One uses but one-third the horsepower for the work that all others require. Another combines the acid with the basic process in the same apparatus and operation. The result of all this has been a series of failures in Germany and Poland, and more are expected when the money put up for them is exhausted. Hence it is necessary for us to remember that not any old vessel with a blast pipe in it will do, nor any kind of iron; but strict attention to every detail. The application of all the experience gained with the regular Bessemer process is essential for the successful exploitation of the otherwise valuable Baby-Bessemer process.

Manganese Bronzes.

Giesserei-Zeitung, March 15.—The addition of phosphorus to melted copper to care for the continually forming oxide, has the disadvantage of subsequent troubles in rolling, due to an excess of phosphorus remaining behind. Manganese will take the place of phosphorus and act to better advantage, as it is rather a good thing to be left behind in the copper. The best alloy of copper-manganese to use for this purpose is one with 30 percent of the latter. Manganese bronze castings with 5 percent manganese are now used more and more in Germany for stay bolts. In England they prefer a 12 percent alloy. There are a number of alloys sold for casting purposes which contain about 60 percent copper and 40 percent zinc, and after adding the manganese alloy, will be of excellent quality, and show some 2 percent manganese remaining in them after casting.

Bronze Ordnance.

The *Engineer*, of London, contains an interesting article concerning the ordnance bronze used by the Austro-Hungarian government. Practically all nations have adopted steel in place of bronze for cannon, but the Austrians have clung to bronze. They, however, claim to have greatly improved the quality of the bronze used. The metal is said to have approximately the following composition:

	Percent.		Percent.
Copper	61.50	to	53.90
Zinc	35.70	to	40.00
Manganese	0.60	to	3.75
Aluminum	0.94	to	1.25
Iron	1.26	to	2.00

It is believed, however, that in some instances the percentage of manganese ranges very much higher, probably up to 10 percent. Good bronze of this character can be forged, rolled, or drawn. They claim to have a secret process for forging the bronze and state that they consider their gun metal superior to any other. All other nations, however, will look upon this bronze with some doubt, owing to the fact that the elastic limit of these alloys is low and that it is practically impossible to make any bronze entirely homogeneous, and also, the bronzes do not seem to be able to resist repeated shock as well as steel. It is claimed for the bronze guns that they are cheap. The cost of the raw material, however, must be greater than gun steel. On the other hand, the cost of manufacture is probably less and the metal itself is of considerable value after the gun is worn out.

PLANS FOR CARNEGIE TECHNICAL SCHOOL.

The architectural plans for the Carnegie Technical School to be erected at Pittsburg provide for six groups of buildings with a total floor space of 580,000 feet. The groups are divided as follows:

Group I.—Administration: General office, 2,000 square feet; faculty rooms, 2,500 square feet; a suite comprising general reception room, a social room for men and a social room for women with a total area of 8,000; an auditorium with 16,500 feet on the main floor, a men's club with 10,000 feet area; a women's club with 4,000 feet; fire proof vault, 5,000; gymnasium 15,000, and a director's residence with 15 rooms, some of which would be arranged for official entertainment. The total area of group 1, exclusive of the director's residence, is 90,300 square feet.

Group II.—The School of Applied Science; Superintendence and general, 13,000; general instruction and service, 14,000; machine design and construction, 16,000; structural steel design and construction, 12,500; industrial, metallurgical and electro-chemical courses, 6,900; mining practice, 12,000; railroad practice, 12,100; applied electricity, 13,200; clay-working and ceramics and manufacture of glass, 17,800; foundry practice, 35,300; steel manufacture, 15,200. Total for group, 181,600.

Group III.—School for Apprentices and Journeymen; Superintendence and general, 11,300; general instruction and service, 16,800; carpentry, 4,000; cabinet and wood-working,

3,400; patternmaking, 8,000; electrotyping and stereotyping, 4,400; electrical work, 7,400; house, fresco and sign painting, 10,000; use of structural steel and iron, 7,000; steam and hot water heating, sheet metal and cornice work, 12,800; blacksmithing and machine forging, 10,600; plumbing, 6,400; masonry, bricklaying and plastering, 9,000; printing, 6,400; mining machinery, 7,400; stationary steam engineering, 4,400; founders' and molders' work, 6,400; machinists' work, 10,000. Total for group, 145,700.

Group IV.—Technical School for Women; Superintendence and general service, 8,600; professional housekeepers, dressmakers and costume designers, 12,100; librarians and secretaries, bookbinding, 10,000; stenographers, typewriters and bookkeepers, 6,700; leather work and upholstery, needle work and embroidery, 10,200; milliners, dressmakers' assistants and seamstresses, 13,200; working housekeepers, housemaids and laundresses, 8,400; cooks and waitresses, 6,400; general instruction, 18,900. Total area of group, 94,500.

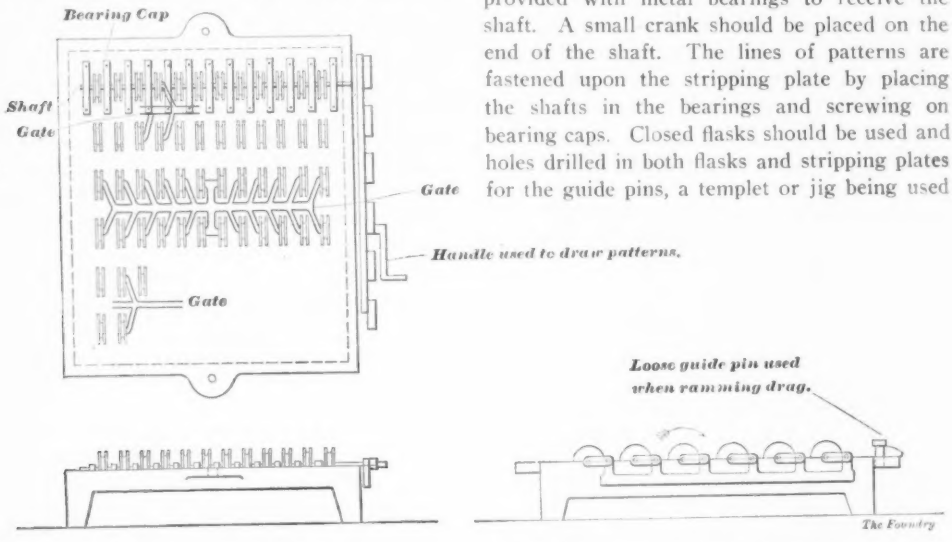
Group V.—School of Applied Design; Superintendence and general, 9,500; interior decoration and design, 12,000; ceramic art, 9,500; elements of architecture, stained glass and stone carving, 7,400; repousse work, glass blowing and leather work, 7,400; typographical art, 10,300; art needlework and furniture design, 11,800. Total for group, 67,900.

Group VI.—Heat, Light and Power Service; Power house, 7,500; fuel storage, 1,500; building for general purposes, 3,000. Total for group, 12,000.

MOLDING SASH PULLEYS.

BY BENJ. D. FULLER.

The pattern should be constructed by splitting carefully machine pulleys through the center and fastening them at equal distances upon a shaft, as shown in the accompanying figures. The stripping plate can be constructed of iron, steel, or wood, and if of the latter, should be iron bound on the edges and provided with metal bearings to receive the shaft. A small crank should be placed on the end of the shaft. The lines of patterns are fastened upon the stripping plate by placing the shafts in the bearings and screwing on bearing caps. Closed flasks should be used and holes drilled in both flasks and stripping plates for the guide pins, a templet or jig being used for this purpose. Care should be taken so that one half the mold will match the other, as both cope and drag are alike. Two pins should be used upon the cope half of the mold and two loose pins attached to the stripping plate by chains, to be used when the drags are being rammed. Six or more lines of patterns can be used on one plate, and 12 or more patterns in a line, making say 72 castings in one mold. The shaft forms the core print and the cores can be sectional or in one length as desired. When ramming, the pulleys are turned upright and are then withdrawn by giving the crank a half turn which revolves the lines of patterns down into the stripping plate. When several lines of pulleys are used, the different lines can be connected by links and one crank may be used to operate all as shown in the figures. In constructing the patterns it is well to allow 1-32 of an inch over one-half of the wheel to be used as a pattern and to bevel the edges which project above the plate. This will leave the patterns projecting 1-32 of an inch above the plate when turned down, but with care the mold can be lifted off without breaking.



LINING AND FLUXING A CUPOLA.

BY ALBERT E. BOLTON.

I read with interest an article in the April FOUNDRY headed "Limestone in the Cupola," by N. W. Shed. I have watched the action of limestone in a furnace with much interest for quite a few years, and find conditions vary according to the size of cupola, air pressure obtained, etc. I find it good practice to adjust the quantity of limestone to the quality of iron you are using. At present I am using limestone as follows: The first charge of iron is 2,000 pounds, 50 per cent of which is composed of scrap. I mix the pig and the scrap thoroughly as it is put into the cupola. This is especially necessary if you are going to use the melted iron in small ladles. After all the iron is charged, I throw one common foundry shovelful of limestone in the middle of the charge on top of the iron.

I get better results by putting the limestone in the middle of the charge than I do by putting it on the coke. To keep the furnace clean does not give me the trouble that slag does. To flux iron for particular work, rather than use too much limestone in the furnace, I put aluminum in the bull ladle. Right here I had better tell you how I keep the cupola and ladles clean. Whenever the cupola needs lining either up to the charging door or just the melting point, I seldom trust to the melter, and never to a bricklayer. I have seen bad effects from both, but more especially from the latter. There is a vast difference between building a house and lining a cupola. I always line the furnace myself, and since starting that practice have never had the iron get to the shell once. You might ask "How do you line your cupola?" In the first place, get the best brick the market affords, and get them to fit the circle of your cupola. Always put in two rows of brick according to the size you want the furnace. Then get any good fire clay. I emphasize the word good, for there is no money saved in using cheap material in this particular branch of the business. Then take two parts lake sand to one of fire clay; get as much together as you think will finish the job, cut it over once, then put through a No. 4 riddle. This is done on a hard floor or a bottom board. Then have a box ready, put in the box as you need it, mix with thin clay wash; just make the mud thick enough so you cannot use a trowel to put it on, for as soon as you get to monkeying with a trowel you are going to leave a place for iron to get between the bricks. (There is no lime in this mortar to hurt your hands.) When you have the cupola lined up, take what mud you have left, thin it down with water, and to a pail of the wash put in one-half pound of carborundum, mix well, then take a clay wash brush and go all over the brick with two coats. After the first heat you will have a glossy skin over the bricks that prevents the direct heat from striking them. It also prevents the bricks from crumbling, especially around the charging door. My furnace today is like glass from the melting point to above the charging door. I lined it five months ago, and have not seen the brick above the melting point since. I use the same mixture every day in lining the ladles, and by so doing am using common clay and molding sand in the lining of same. Try it.

This is my initiative article and am like the man who made his first speech. When he got up he started with, "Mr. Chairman and Gentlemen, I know considerable about this subject, but just now I cannot think of it."

The Coburn Trolley Track Mfg. Co., of Holyoke, Mass., have just issued a catalogue entitled Catalogue No. 18, in which they describe the different forms of conveying machinery of the Coburn Trolley Track type which they manufacture. Many applications are illustrated, and tables giving capacities, etc., included, which will be found very instructive to all who are contemplating the installation of such apparatus.

The Monarch Engineering & Mfg. Co., of Baltimore, Md., have issued a catalogue describing the Steele-Harvey melting and refining furnace manufactured by them. This catalogue contains a description of the furnace, directions for its use and considerable matter which will be of interest to foundrymen.

The National Electric Co., of Milwaukee, Wis., have issued a new catalogue of direct current generators and motors, entitled Catalogue No. 61, in which they describe one of the lines of apparatus which they manufacture. The catalogue is very well gotten up, containing tables of sizes, etc.

The American Blower Co., of Detroit, Mich., have just issued a neat catalogue of disc fans, entitled "A B C" Disc Ventilating Fans. All types of disc ventilating fans manufactured by this company are described in the catalogue, and tables of capacities and power required are given, also several useful tables for calculation in connection with ventilation problems.

PATTERN COSTS.

BY R. W. M'DOWELL.

In most small pattern shops considerable trouble is experienced in finding accurately the cost of patterns. Of course a record can be made of the labor for any given time, usually a month and an estimate made of the material used, but from this the real cost of the patterns made during that time can not be obtained, for much labor and material is usually expended in making repairs either on patterns or flasks or to the plant itself. First, if all of this is charged to the pattern account a false asset is shown and if this goes on from month to month there will be a serious discrepancy between the resources shown on the ledger and those actually existing. Second, this way of figuring gives no record whatever of the cost of each separate pattern. It is necessary to know the cost of each separate pattern, both for stock and for labor, not only in the case of patterns made for the shop, but for those made for outside parties. In many places, when an outside customer comes in to have a pattern made the decision is made, "We will charge so-and-so $28 for the pattern on his order," without having any actual idea of what the pattern actually cost. Twenty-eight dollars may be a good guess, but it is far more likely to be a poor one and either be so low as to fall below the actual cost of the pattern, thus cutting down profits on the order, or, as is common in many cases, it may be so high as to seem exorbitant to the customer. In such a case as this you may feel fairly sure that the customer will look for another place to have his next pattern made.

It is not a difficult matter to keep accurate costs of patterns, providing a proper system is devised and strictly adhered to. A system that is run loosely and deviated from to fit circumstances is worse than no system at all as it will be depended upon just as though it were being carried out properly and hence will prove very misleading.

Taking for example the case of a pattern shop employing six men making patterns for use in their own foundry and also for outside customers. Of these six men, four are patternmakers and two are carpenters. The same system could be applied to a larger number of men, but for the sake of convenience in illustration the forms are filled in for this small number. The foreman can easily keep track of the time of the various men on each order by exercising a little care and using the forms here shown. Whatever method is used for general time keeping can be carried out in the usual way, the foreman's report serving as a check.

REPORT OF LUMBER USED IN PATTERN SHOP ON Jan 15

I have to-day used the following Lumber: —

No. Pcs.	Kind	Size	Lin. Feet	Feet	Total Feet	C. Order	S. Order	This space for office use. Price	Total	Ck.	Charge To
2	Pine	12"x12"x1"			24		115	40 00	96		P. & Fl.
1	"	5"x12"x1"		5		576	3911	"			576
1	"	3"x6"x4"		6	11	"	"	"	44		"
8	Hemlock	5"x4"x2"		43⅓			420				Repair
8	"	8"x4"x2"		43⅓	85⅔		"	20 00	1 71		"
4	Pine	4"x16"x1"		21⅓		611	399				P. & Fl.
4	"	8"x16"x1"		43⅓		"	"				"
2		4"x4"x4"		10⅔	74⅔	"	"	35 00	2 60	119	"
					195				5 71		

J. Lindsey Foreman

FORM 1.

Shop Arrangement.

The shop itself should be kept solely for the work room and not for the store house. Heavy stores and supplies should be kept in a separate room large enough to contain the

necessary kinds of lumber in different piles or racks and should, if possible, open into the pattern shop proper. It should be kept locked, the key being in the possession of the foreman, who is required to see that all lumber taken therefrom is strictly accounted for. The amount of lumber required for a pattern or order of patterns should be carefully estimated and just this amount taken out and charged to the order. If more is required as the work progresses it can be gotten and an-

articles can be kept in the pattern shop and should also be kept track of by periods and charged to the pattern account. In the main books a certain percentage of this amount is added to the cost of each order, the amount depending upon the proportion which the order bears to the total amount of the orders completed during that period.

One man in the shop should do all repair work and all supplies issued to him should be charged to repair account. Flasks made

SUPPLIES USED IN PATTERN SHOP FOR WEEK ENDING Jan 23 1904

	Stores		P. Shop	Order	Amount		Ck.
Glue ½ lbs. @ 26		13					
Shellac 8 lbs. @ .33	2	64					
Pre. Shellac lbs. @							
Alcohol 1 gal. @ —		65		394	2	19	
Wax ¼ lbs. @ 8		62		399	2	38	19
Fillet 52 ft. @ .01¾		99		418		55	
Nails 4 lbs. @ 3			12	420		12	
" 3 lbs. @ 3			09				
" lbs. @							
Brads 2 bxs. @ 20			40				
Sandpaper 8 Sheets @ 2½			20				
Incidentals							
Total	4	43	81		5	24	

J. Lindsey Foreman

FORM 2.

other report made. These reports should be made out in such a manner as to provide a copy for the storekeeper, to be entered in his records.

Sundry Material.

Such material as glue, shellac, fillets, etc., should be gotten on requisition from the storekeeper at certain periods, and a record kept of the quantity used during this period. Nails, sandpaper, pattern letters and similar

to replace wornout or destroyed flasks should also be made by this man and charged to the repair account.

Material Reports.

Form 1 shows foreman's material report. This is not necessarily made out each day, as it is only necessary when lumber is issued. Each time that lumber is taken from the store room or sheds, the foreman notes the quantity, quality, kind, etc., on the report

which he turns in to the office in the evening. Form 2 shows the report for the other supplies used, and is turned in once a week.

Time Keeping.

It is necessary to have a card system of keeping track of the time on each pattern, as this is the main item in its cost. For this purpose when a man is assigned to a job he should not under any circumstances be shifted to another job until he finishes the one to which he was first assigned. To keep track of the work on each job, Form 3 is made out each day by the foreman. Every man has

REPORT OF LABOR IN PATTERN SHOP Jan. 15. 1904

No.	Name	Order No.	From	To	Time	Total	Rate	Cost	Total	Ck.
19	McNeelis	418	7:00	5:30	10		3 50	3 50		
84	Hemphill	418	7:00	12:00	5		2 00	1 50	4 50	
	"	394	12:30	5:30	5			1 00		
29	Bower	394	7:00	5:30	10		3 50	3 50		
46	Padden	394	7:00	4:00	8½		3 50	2 98	7 48	
		399	4:00	5:30	1½			52		
10	Williams	399	7:00	5:30	10		4 00	4 00	4 52	
47	Benson	(420)	7:00	11:00	4		2 00	80	80	
									17 30	

FORM 3.

two extra lines left under his name so that there may be plenty of room in case he works on more than one job during the day. The cost column is for the work of each man while the whole amount of labor on each job for the day is entered in the total column. These columns can all be proved by figuring the total time and comparing it with the sum of the time in the other columns. When a job is completed its shop order is returned with this sheet and the foreman makes a circle around the number of the completed order to call attention to this fact.

Time recording machines such as are in use in many up-to-date shops would be found very useful in connection with the work of time keeping. One advantage of these is that they furnish an accurate statement of time. It is not intended that the foreman's report should be so constructed that the amount due each patternmaker can be figured from it, but it is intended simply as a means for determining the cost of each pattern.

Working of the System.

The cost records proper can be made out in any form which is desirable. This depends altogether upon the nature of the business and the individual preference of the management. Books, cards, loose sheets or lists could all be used in different ways according to the requirements. The writer's personal preference is for the card system and a card form is shown which does away with the cost sheet, all material and labor being summed up on this form as the work progresses.

To illustrate the system more clearly shop order No. 399 is carried through the different cards. This order is for a bed and base plate pattern. The castings on this order are made to fit together and hence the cost of the pat-

SHOP ORDER

Date Jan. 13 1904 Job No. 399

To J. Lindsey Foreman Make the following:

1 Base Plate Pattern #G119
1 Bed " " #G120
For order #611
Both from Tracing #519

This order to be returned to office when work is fully completed — J. F. Mahlin Supt.

Date Completed Jan 20 1904 Signed J. Lindsey Foreman

FORM 4.

terns is always figured together as the patterns must be made in pairs. The order form may be in any convenient style. Form 4 is given as an illustration. This may be charged in duplicate, the original going to the foreman, while the carbon copy is filed according to its number in the office, until the original returns from the pattern shop, when it is filed in a drawer for finished orders.

When the foreman of the pattern shop is ready to start work on an order he turns to his index, Form 5, and locates his tracings. The tracings should be kept in wide shallow drawers, so that they can be located easily when wanted. These drawers all bear numbers and are divided into sections which are also numbered so that reference to any drawer can be made readily. Whenever the office receives drawings or contracts they make out a card as shown and send both drawings and card to the pattern shop where the foreman files the former where he wishes, making a note on the card of the location.

Title: Bed Plate, Base Plate, End Brace — Date: Aug 8, 03 — Case No. 2 — Sec. No. 2 — Drawing / ~~Tracing~~ / ~~Blue Print~~ — Drawer No. 8 — Drawing No. 7

Scale		Size	Casting No.	
Date 1903	Customer Order No.	Our Order No.		Remarks
Aug 8	1319	429	36	End Braces
" 29	1597		36	"
Sept 13	1661	611	40	Base Plates
"	"	"	40	Bed Plates

FORM 5.

Having found the required tracings he lays out the work, assigns the proper number of men to the job and issues lumber and other supplies and material required. Requisitions for this material may be on a form like Form 6. As the work progresses from day to day and the reports come in they are entered on the pattern record Form 7. The lumber is issued as shown in the illustration from the foreman's report. The sundry supplies from the weekly report and the lumber from the daily report. The cost of miscellaneous supplies on each order is obtained by taking the percentage of the total expense for miscellaneous supplies corresponding to the proportion which the order on hand bears to the total amount of work completed during that period.

REQUISITION SLIP

For J. Lindsey Storekeeper Date Jan 15th

Required For Patterns Job No. 399

Draw material for one order only on this slip — J. Lindsey Foreman

FORM 6.

The majority of material of this kind can be closely calculated and the remainder can be estimated very easily. As everything is reported it will

G 119/120

Pattern Base and Bed Plate Order No. 397
From Drawing No. 519 No. Pcs. 2 Material Wood

Date		Material	Labor	Total	Location
1904					
Jan.	15	2 60			
	15		4 52		Room 1
	16				
	18		7 50		Side C
	19		7 50		
	19	2 38			Shelf 4
					Section 18
			14 52		
		4 98	4 98	24 50	

FORM 7.

only make a difference of a few cents one way or the other on any pattern and this difference will balance itself during the week so that the ledger account will correspond with the patterns on hand.

This system furnishes the management with some information to use in figuring the value of the plant, as everything of material consequence is reported intelligently and not as a mere guess.

Variations in this system would of course have to be made to suit different lines of work, but if it is laid down as a law and strictly adhered to that no work shall be made without a written order and no supplies issued or labor expended without an immediate report being made of it, little trouble will be experienced in adapting these methods to almost any pattern shop.

CASTING IN CORES.

BY JOHN F. PITZ.

A customer of ours recently desired a 7-foot melange casting, and the pattern for this would be too expensive, also the room for storage was a serious consideration, as he planned to make a number of different sizes. The objection to sweeping it up in green sand was that the face of the casting would be full of lumps. The foundryman wanted from 10 to 12 cents per pound for making it in loam and also could not guarantee quick enough delivery. For these reasons it was decided to make it in segment cores. Fig. 1 shows a section of one side of the mold. A bed was first swept in green sand with a projection as shown at D. The eight segment cores A were set against projection D. The eight segment cores B were then set inside cores A. Before filling in with sand behind the cores care should be taken to see that the metal will be of uniform thickness. The runners were cut in the cores B, cake segment cores C were used on top of cores A and B. The object of making A and B in eight segments is to prevent their becoming crooked during drying and also to facilitate handling. Fig. 2 shows a section through the core box for core A, taken along the length of the box. Fig. 3 shows a cross

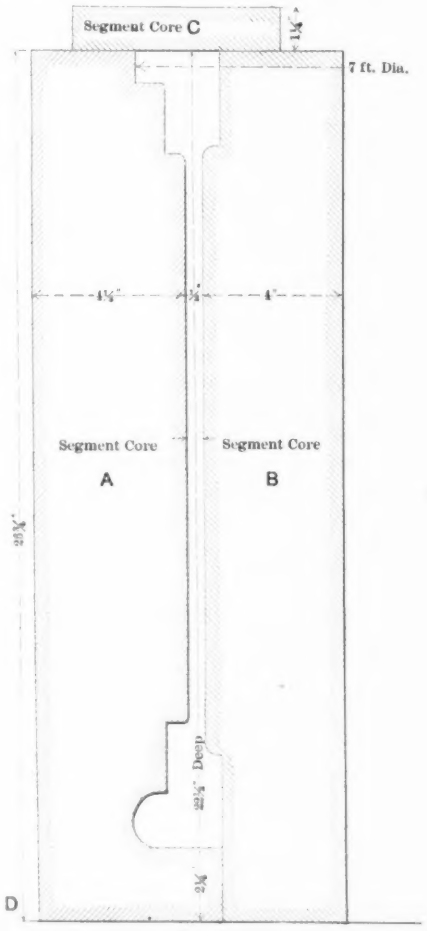


Fig. 1

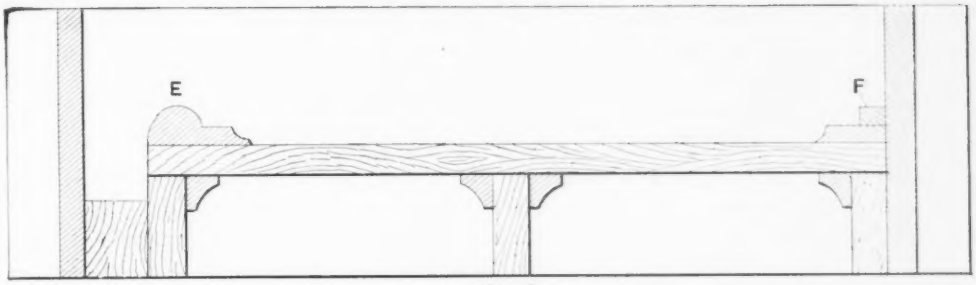


Fig. 2

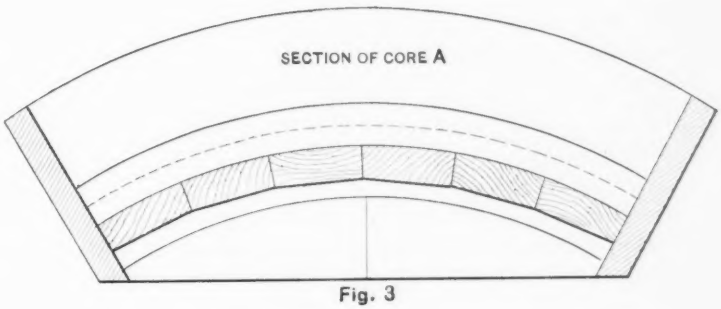


Fig. 3

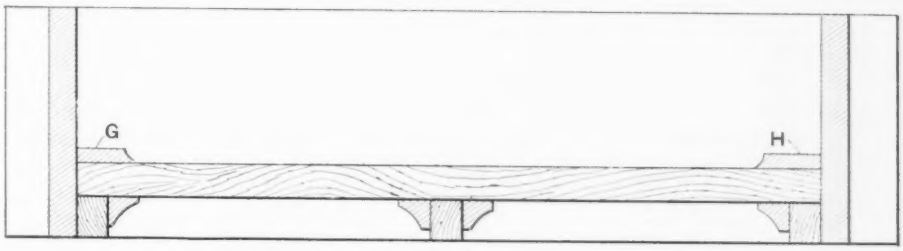


Fig. 4

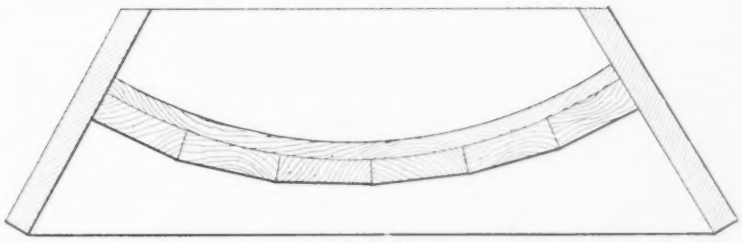


Fig. 5

section of box for core A. Fig. 4 shows a longitudinal section of the core box for B, and Fig. 5 a cross section of core box for B. The strips E and F in core box A and G and H in core box B were bent in.

The general construction of the boxes is quite plainly shown. Core box A was strengthened with corner pieces. Core box B was arranged with loose sides, the core being swept off level with the straight side of the box, after which the sides were removed. This permitted the drying of the core on a flat core plate.

The core box for the core C is shown in

Fig. 6. By this method the castings were made for 3½ cents per pound and delivered quicker than would have been possible had

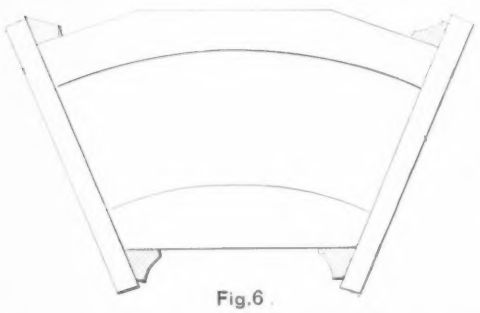


Fig.6

time been taken for making a pattern, or had the work been swept up either in loam or green sand. The cost of making the core box and sweeps complete was $21.00.

SPECIFICATIONS FOR CAST IRON AND FINISHED CASTINGS.

Dr. Richard Moldenke, secretary of the American Foundrymen's Association, communicates to the secretary of the American Institute of Mining Engineers the following discussion on his paper read before the Atlantic City meeting of the institute, being largely in reply to points brought out in the discussion at the meeting:

In following the discussion on the specifications for cast iron and finished castings, I was strongly impressed with two points which might be ventilated to advantage more fully from the view of the practical foundryman. First, the reasons why only silicon and sulphur were specified and not phosphorous, manganese and carbon; and second, why but little was said concerning the presence or iron oxide in the material. With regard to the first point, the modern foundryman always demands a full analysis of the pig iron on which he is figuring with the seller; yet, when the order is placed, only the silicon and sulphur contents of the pig iron are of importance.

Concerning the presence of phosphorus, all the pig iron made for foundry purposes is divided into three classes, namely, containing less than 0.4 percent; between 0.4 and 0.8 percent, and more than 0.8 percent. In all of these three classes a choice is to be had of the silicon and sulphur contents. The pig irons containing the lowest ranges of phosphorus will be used for making special grades of gun iron, car wheels and specification castings; and to the foundryman it is immaterial whether the phosphorus present is a mere trace of 0.4 percent, provided it be not above the latter limit. If ordinary classes of jobbing work, machinery and gray iron castings in general, pig iron containing the medium percentage of phosphorus is desired, and in this case also it is not important whether the phosphorus content be at the upper or at the lower limit, provided it does not go beyond either. Finally, for art work, stoves and novelty castings, or those in which great fluidity of the metal is required, the high range in phosphorus is selected, and it matters little how high this range is, for the reason that any great discrepancy will be adjusted by proper mixing before melting. Furthermore, the customs of the trade are such that no pig iron merchant would think of selling a high phosphorus pig iron to the maker of boiler castings, which are tested under pressure, and, therefore, might endanger life. The stove manufacturers have learned to use certain pig irons high in phosphorus and would not think of going outside of this class of metal; consequently, the element phosphorus is not so all-important in foundry practice as it is in making steel; and, as a result, it was not deemed necessary to burden the general specifications for the sale of pig iron with the phosphorus requirements.

A similar condition of affairs exists with regard to the quantity of manganese present in pig iron. In this case there are two classes of metal; the line of division being 0.8 percent of manganese. Pig irons containing a percentage of manganese less than 0.8 percent are valuable for making ordinary foundry castings; while those pig irons exceeding 0.8 percent manganese will be sought for making special castings on account of their high manganese content.

The founder, in glancing over the analysis presented by the agents of the various pig iron manufacturers, will at once remove from all consideration those furnaces which make iron too high or too low in phosphorus, or too high in manganese for his use, and his selection will be made from the rest according to the silicon and sulphur contents of the metal.

Finally, as to the carbon, if anything, the foundryman reduces the quantity present in the pig iron by the addition of scrap-steel in the melting process. Therefore, but little attention is paid to the total carbon content of American pig irons, which is almost invariably present in proper proportion. For special cast-

ings, however, which require undue softness, a high percentage of total carbon is sought. A pig iron containing a carbon content below the normal arouses suspicion, and indicates that something has been wrong at the furnace. If an occasional specification is seen asking for a given percentage of total carbon, it is probably necessary for a given purpose. On the other hand, a specification (and I have seen several) demanding more than a given minimum of graphite is an evidence of ignorance, and the furnaceman can only hope that some day the maker of a specification of this kind will learn more of foundry metallurgy and withdraw the useless and objectionable requirement.

Taking up a second point of importance—the oxidation of the metal—the lengthy discussion of this subject which took place at the Atlantic City meeting showed that this expression was understood to be the absorption of oxygen from the blast, leaving it in the iron as occluded gas. This effect is not strictly that with which the foundryman has to contend. He is troubled with an actual dissolved iron oxide, and knows that no matter what melting process he uses, the quantity of this objectionable constituent is sure to be increased at every melting.

The steel man is comparatively free from this trouble, because he uses much higher temperatures, and simply adds ferro-manganese to remove at once any oxidation products in the bath of metal. Suppose the blow of the converter were interrupted at a point where some silicon still remained in the metal, and the metal was then cast into molds, gases would be liberated and a weak product would result.

After all, any foundry melting process is similar to the converter process, excepting that the blast pressure is less, the time of action longer, and no attempt is made to refine the metal. The air furnace with a top blast used in the malleable iron process is practically a converter with a top blast, instead of one at the bottom or side.

It is my belief that the difference in excellence between cold blast charcoal iron, warm blast charcoal iron, and hot blast coke iron, all of like composition, lies solely in the degree of freedom from oxidation of the metal as it flows from the furnace spout. Foundrymen instinctively realize this effect, and in making special castings the utmost care is taken to get pig irons which will yield castings of the best service qualities, the composition being constant. Even in the malleable iron industry, no one who has to make "specification castings" (especially good work), would think of using straight Bessemer pig iron for this purpose, even though the chemical composition meets the requirements. The selection will be "Bessemer malleable," or pig irons with an analysis practically within the Bessemer limit for sulphur, and made of better quality, especially with the aim to avoid weakness, which really means oxidation. I have repeatedly used ordinary "Bessemer" in making malleable castings, with the result that the tensile strength was much below the average. As a result of this experience, I used the pig iron only from those blast furnaces which look after these matters more closely and make a more satisfactory product.

What the foundryman fears most, in using the open-hearth furnace for his work, is the occasional rising of pieces of the furnace bottom which are saturated with burnt iron, and oxidation products. These pieces float on the surface of the bath of metal and gradually yield to it the iron oxide contained, with the result that the metal in the bath, though of proper chemical composition, loses its life as soon as tapped, and "skulls" everything into which it flows.

Foundrymen know that the pig iron they use, be it as good as it can be made, is never improved in the melting. Even the best of them would be glad to do better work, if they knew how to do it. The most pressing need at present is the assurance that they are getting the best pig iron that can be made for a given composition, and that the blast furnaces also are trying continually to improve their work. If both foundryman and furnaceman will keep this improvement always in mind, there is nothing to fear for the future, and in time we may be able to correct irregularities which are now beyond our knowledge.

The Winnebago Machine & Foundry Co., and the Polar Star Electric Co., of Faribault, Minn., have been incorporated under the name of the Faribault Mfg. Co., with an authorized capital of $50,000, one-half of which is paid up. They have purchased a building 36 by 82 feet and are putting it in shape for operation.

The Tyler Foundry & Machine Works, of Palestine, Texas, which have been idle for several months have been purchased by R. Nasmith of Belton and John Hughes of Dallas, Texas, who will reopen them at once.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and Using Cast Iron. Address all inquiries to W. J. KEEP, care of The Foundry.

Chilled Rolls.

Question. What percentage of silicon, sulphur and other metaloids will result in the greatest strength for rolling mill rolls.

Answer. The analysis of a roll which gave exceptionally good results was T. C. 2.81, G. C. 1.71, C. C. 1.10, Si. 0.78, Phos. 0.50, S. 0.061, Mn. 0.21.

Strong Foundry Iron.

Question. The average of six casts in our foundry gave the strength of a test bar 1 inch square by 12 inches long as 2,800 pounds. How does this compare with ordinary practice.

Answer. It is very much above the ordinary foundry product, which would be: Light castings, 1,800; medium, 2,200; heavy, 2,400. For castings of specially high strength: Medium, 2,400; heavy, 2,600. Air furnace work would run between 3,200 for medium and 3,900 for heavy.

Use of Malleable Scrap in Foundry.

Question. Will you please inform us if there is any successful method in operation at present of utilizing malleable scrap in regular gray iron mixture for machinery castings, and if so, what grade of iron and analysis of same, to mix with it in order to produce suitable gray iron castings for agricultural implements, that would be satisfactory in point of strength and softness for machinery?

Answer. Readers of The Foundry are requested to answer this question. It is understood that malleable scrap cannot be used in the gray iron foundry. In car wheel mixtures composed of coke iron it is added to aid in producing chill. Remelted alone it produces white iron castings. In adding it to a gray iron mixture it must be considered as white iron with about .70 silicon therefor deficient silicon must be made up by the other irons in the mixture. As such scrap is deficient in carbon and is very low in phosphorus, it lacks fluidity and must be mixed with irons high in carbon and in phosphorus. Small quantities of malleable scrap are not felt in a soft mixture but I do not know how much can be used. It is a very easy thing to try in your own cupola.

Soft Light Castings.

Question. "I am making castings weighing about six pounds with lugs in both cope and drag each from 1 inch to 1½ inches long and from ½ to ¾ inches thick. This casting has to be soft as it is drilled all full of holes ⅛ inch diameter and smaller 100 of them and the lugs are all cut up. There is more or less trouble with hard iron and where the castings are soft, 10 or 12 in a hundred from the same heat will crack.

We use 2 or 3 kinds of pig iron and no foreign scrap. Our remelt is about 40 per cent of the iron charged. What should be the analysis of the charge for such castings?"

Answer. Select pig irons that will produce soft castings. You can soften by increasing silicon. You can anneal all castings and get them as soft as you please. I would think that for such castings this would be best. Or you could anneal only such castings as come hard. Probably it is no fault of the chemical composition of the iron. You want silicon about 2.75 per cent and keep phos. sul. and Mu. as low as possible. Be very careful to use the best of coke with sulphur not over .75 per cent.

Blowholes in Castings.

Question. "I send you a casting that is full of small holes on the upper side. We use good iron and do not have this trouble so much in our heavy work. These holes are not from the cutting of the gate but from dirt or gas in the iron."

Answer. The universal remedy for such holes is good venting of the mold and pouring hot. A little ferro manganese or a little aluminum placed in the ladle would probably dispose of them.

Shrink Holes in Castings.

Question. "We have been running the mold that we are having trouble with close to 2 per cent of silicon in the castings. The pig iron we figured 2.55 per cent as per furnace analysis. The scrap at 2 per cent silicon which we believe was a little high. We have placed on these castings a riser but it does not seem to help the shrink holes."

Answer. As the shrink holes are at the part that cools last it would seem that a riser at that point would not be the thing to do. I think that I would bed a chill on each side of the mold so as to cause the iron to set quickly at the point where the shrink holes appear. I would also try clean cast iron borings as described in "Cast Iron" page 131.

Cracking of Casting.

Question. We are making a light casting 12 inches long by 8 inches wide, about the same as stove plate only it has lugs 1½ inches wide and ¾ inch in both cope and drag. It has a hole 5 inches diameter in the center in which the piece is gated. Sometimes for a week at a time from 3 to 25 of the 80 pieces made will crack near one of the lugs. We use no foreign scrap. Our mixture is 500 Buffalo, 300 Everett, 75 Ashland. About 40 per cent of our mixture is return. Can you tell me what the analysis of such castings should be.

Answer. While this data seems to the writer quite full, yet it lacks the very information needed. Such a casting should be seen before it would be possible to suggest an improvement in gating. The name of the two principal irons without the number of grade or the analysis gives no idea of the iron mixture. You should use some method for keeping the silicon in your mixture uniform and for knowing the quality of your iron. It must be either chemical or mechanical analysis. The fact that the cracking lasts for a week or so and then stops shows that it is due to the lack of silicon in a car load of iron. Ashland should be increased to stop the cracking. I do not know the nature of your other work but should say that your silicon should be 2.75 per cent, phosphorus, .80 per cent sulphur, .08 per cent. The T. C., C. C., and Gr. C. will be satisfactory if you get the silicon right.

Which Coke Will Melt Most Iron.

Question. In a cupola melting from 5,000 to 7,000 pounds of iron half No. 2 soft Northern and half machinery scrap which will melt most iron, a 72 hour coke that weighs 37 pounds to the bushel or a coke that weighs 45 pounds?

How many pounds iron will one pound of 72 hour foundry coke melt where the cupola melts 5,000 pounds of iron composed of 750 pounds of carwheel iron 2,500 No. 2 pig and 2,000 pounds machine scrap?

What is the standard weight of a bushel of coke?

Answer. All will depend upon the quality of the coke. If the coke is low in ash (say 10 per cent) the more dense it is and the more iron it will melt, but if the increase in weight per bushel is on account of high ash or on account of being wet the light coke will melt most in such a small cupola.

The melting ratio in such a small cupola will depend on the bed of coke necessary which in turn depends upon the diameter of cupola and upon the height of tuyeres above the bottom. One to six would be good melting.

A bushel of coke will weigh 33 pounds to 50 pounds to the bushel, but a good coke would weigh about 40 pounds.

The New Obermayer Catalogue.

The S. Obermayer Co., of Cincinnati, Chicago, and Pittsburg, have just issued a catalogue 6 by 9 inches, containing 370 pages. It is neatly and strongly bound in blue buckram with white lettering, which gives a very pleasing effect. The statement on the cover that they manufacture *"Everything You Need In Your Foundry"* is impressed on one as he looks through the volume and notices the large number of items, which can be obtained from this house, not only for the foundry, but also for the pattern shop. One thing which strikes a person particularly in glancing through the book is the picture and description of their chemical laboratory. This is used for the examination and control of the supplies purchased for the manufacture of facings and other materials. For the past 15 years, the laboratory has been under the management of Mr. Herman Mende, formerly of the University of Gena, Germany. When a company shows a sufficient amount of interest in their product to install and equip such a laboratory for the control of the material which enters into it, it is evident that they must be giving careful attention to all details of their business.

It would be impossible to enumerate the matter contained in this catalogue, but it is sufficient to say that it covers a very large variety of standard material and that the book should be in the possession of all foundrymen or patternmakers.

This catalogue is no doubt the largest and most comprehensive of its kind ever published and we are advised that this book will be sent *free* to any foundryman in the world.

W. H. McCarthy, 514 Chamber of Commerce, Chicago, formerly manager of the Chicago Fire Brick Co., has been appointed western sales agent of the Reese-Hammond Fire Brick Co.; also of the Oak Hill Fire Brick & Coal Co., Oak Hill, O., and will handle the complete line of these company's products, as well as kindred supplies.

The Oil Well Salvage Co., Bowling Green, O., are planning to build a foundry at Bowling Green for the repair of oil well machinery.

ASSOCIATIONS AND SOCIETIES.

American Foundrymen's Association.

Provisional Programme for the Indianapolis Convention, Indianapolis, Ind., June 7th, 8th and 9th.

Tuesday, the 7th.

Morning. Devoted to Registration, visiting plants, committee meetings, etc.

Afternoon 2 P. M. Opening Session.

Address by the Hon. Winifred T. Durbin, Governor of Indiana.

Address by the Mayor, Hon. John W. Holtzman.

Address by the President of the Commercial Club, Hon. John W. Kern.

Address of President American Foundrymen's Association.

Report of Secretary-Treasurer.

Report of Auditing Committee.

Report of Committee on the Standardizing Bureau.

Report of Committee on Foundry Trade Schools.

Report of Committee on Insuring Patterns.

Report of Committee on Instruction Papers.

Report of Secretary of Foundry Foremen's Section.

Report of Secretary of Metallurgist's Section.

Presentation of Standard Specifications for Pig-Iron, Gray Iron Castings, and Malleable Castings, and Discussion thereon.

Memorial on Standard Methods for Measuring the hardness of Molds.

Memorial on Standard Specifications for Foundry Coke.

Evening 8 P. M. Business Session.

Address by Geo. H. Hull, of New York, on the Pig-Iron Warrant System as applicable to the Foundry.

Molding Machines and their Uses, by E. H. Mumford, Philadelphia, Pa.

Molding Machines of Today, by Herbert M. Ramp, Schenectady, N. Y.

The Molding Machine, by S. H. Stupakoff, Pittsburg, Pa.

Some Labor-Saving Suggestions for the Foundry, by H. F. Froham, Cincinnati, O.

Moisture in Molding Sand, by W. S. Morehouse, New York City.

By-Product Foundry Coke, by Clarence M. Schwerin, Chicago, Ill.

Cupola Fan Practice, by W. H. Carrier, Buffalo, N. Y.

Standard Systems for Making Beds, by Thos. D. West, Sharpsville, Pa.

The Engineer and the Foundry, by Dr. R. Moldenke, Watchung, N. J.

Wednesday, the 8th.

Morning. Business Session under the care of the Foundry Foremen's Section, at 10 A. M.

Business of the Section. Reports, appointment of Committees. Election of Officers for the ensuing year.

The Need of Modern Foundries, by David Spence, Chicago, Ill.

The Core Bench, by Benj. D. Fuller, Allegheny, Pa.

Foundry Apprentices, by Chas. H. Thomas, Newark, N. J.

A Plea for the Coremaker, by Alex. T. Neil, Newark, N. J.

A Practical Method of Making More Competent Molders, by Jas. A. Murphy, Cincinnati, O.

Specifications—What they mean to the Foundryman, by David Reid, Columbus, O.

Shot Iron in the Foundry—Discussion, opened by James Boyle, Salem, O.

Afternoon. Business Session. Especially devoted to the interests of the Foremen Patternmakers, at 2 P. M. A trolley ride will be arranged for the ladies during this time. Special announcement will be made at the time.

Patternmaking in its Relation to Foundry Costs, by Wm. H. Parry, Brooklyn, N. Y. Discussion on the many points brought out in this paper.

Discussion—Errors in the Pattern Shop.

Discussion—Length of Apprenticeship Term in the Pattern Shop.

Discussion—Should the foreman patternmaker be empowered to change designs when necessary to facilitate work in the pattern shop and foundry?

Discussion—On the advisability of forming a Section for Foremen Patternmakers within the Association.

Evening. Smoker.

Thursday, the 9th.

Morning. Business Session under the care of the Metallurgical Section, at 10 A. M.

Business of the Section. Reports, Appointment of Committees. Election of Officers to serve the ensuing year.

Scrap Iron, by W. G. Scott, Racine, Wis.

Effect of Manganese on Cast Iron, by Herbert E. Field, Pittsburg, Pa.

The Value of a Chemist and Metallurgist in a Manufacturing Plant, by H. C. Loudenbeck, Wilmerding, Pa.

Segregation of Sulphur in Pig Iron, by J. J. Porter, Dubois, Pa.

Memoranda on the Metallurgy of Cast Iron, by Arch. M. Loudon, Port Chester, N. Y.

Pig Iron and its Constituent Elements, by H. L. Williams, Chicago, Ill.

Hard Castings, by H. E. Diller, Chicago, Ill.

A Paper, by F. G. Wilson, Detroit, Mich.

Discussion on the Taking of Samples from Pig Iron.

Discussion on Standard Methods of Analysis.

Discussion—Does Chemical Analysis fully represent the physical Properties of Cast Iron?

Discussion—What Features in a technical Education are most valuable to the Iron Metallurgist.

Afternoon. Business Session. Especially devoted to the Interests of Foundry Accountants, who are requested to come prepared to offer subjects for Discussion. Session at 2 P. M.

Payment of Labor, by John Magee, Chelsea, Mass.

Notes of a Successful Piece Price System, by John Magee, Chelsea, Mass.

Economy in Foundry Cost Finding, by Jas. C. Loughry, Elyria, O.

Foundry Accounting, by Kenneth Falconer, Montreal, P. Q.

Discussion on the Advisability of forming a Section for Foundry Accountants within the Association.

Reading and Discussion of papers coming in subsequent to the Printing of this Circular.

Evening. Business Session, 8 P. M.

Unfinished Business.

New Business.

Election of Officers.

Adjournment to St. Louis.

The Philadelphia Foundrymen's Association.

HOWARD EVANS, SECRETARY, CARE J. W. PAXSON CO.

The Philadelphia Foundrymen's Association entertained the members of the Pittsburg Foundrymen's Association and the New England Foundrymen's Association at a "vaudeville dinner" at the Manufacturers' Club in Philadelphia, the evening of May 4. In accordance with the outlined program the blast went on at 6:30 and the pouring off continued for several hours and more. In the department of the program set down as "Foundry fixtures and office furniture," Thomas Devlin appeared as "The Old Man;" Howard Evans presided in the capacity of "Cupola Boss;" Josiah Thompson, "Labor Agitator;" George C. Davis, "Original Alchemist;" George S. Rominger, "Blast Gauge;" J. H. Sheeler, "Spark Arrester;" and Dr. Elmer E. Brown, "Blower." The toasts were announced as "Pickings from the scrap pile," and there were twenty-eight selections. Interspersed between the toasts were a number of excellent vaudeville acts.

Thomas Devlin as president of the Philadelphia Foundrymen's Association, introduced Dr. E. E. Brown as toastmaster. Mr. Devlin called attention to the birth of the general foundrymen's association movement which occurred about eight years previously at Philadelphia, when the American Foundrymen's Association was organized. The National Founder's Association came on subsequently as the result of the spirit of good fellowship displayed at this initial gathering.

A. E. Outerbridge, Jr., of Philadelphia, spoke to "The Triplets—Boston, Pittsburg and Philadelphia," and limited each journey to sixty seconds, as one of the shop rules provided that no molder was allowed more than three minutes to pour off, and no slopping over was permitted under any circumstances. A. W. Slocum, president of the Pittsburg Foundrymen's Association, attempted to solve the problem, "Was it the moon or an elusive St. Louis Fair subscription?" and for his effort he was voted a "jolly good fellow." Dr. Richard Moldenke, secretary of the American Foundrymen's Association, told of "A model foundry exhibit as an educational factor" in a most original way, and before his allotted 180 seconds elapsed succeeded in impressing those present with the necessity of their presence at the Indianapolis convention next month. John Birkinbine attempted to solve the conundrum, "If the Ship Trust is only a bubble, why are the stockholders in the consomme?" and following him Stanley G. Flagg, Jr., explained why a foundryman was justified in taking orders at cost in order to keep his plant running. Theodore H. Colvin tried to explain what the yield of burnt iron is and also told how he arrived at these conclusions, while S. G. H. Fitch was rather embarrassed in being requested to answer for the necessity of opening a keg when the foundry runs the first heat.

William H. Ridgway, of Coatesville, Pa., successfully answered his toast, "If the biler busts, what will we hook her to?" His remarks furnished food for thought and were given additional weight by being brief and to the point. He asked how many foundrymen

took sufficient interest in their molders to extend sympathy and assistance in time of trouble. How many visited their men at their homes who were kept in on account of illness, and how many sent around the pay envelope every week when their faithful employes were unable to earn a livlihood on account of illness. He expressed the opinion that a little more of this sort of attention on the part of employers would greatly minimize strikes if not preventing their occurence entirely and the National Founders' Association would not be a necessity. It is needless to say that these remarks were vociferously applauded. Henry A. Carpenter explained what Providence had to do with the cotton corner, while W. S. Hallowell told why foundrymen should agree on prices.

During the evening a telegram from J. A. Holmes, chief of the Mines and Metallurgy division of the St. Louis World's Fair, was read by Toastmaster Brown. Mr. Holmes said that the St. Louis Exposition had agreed to bear the expense of a foundry building for the foundry exhibits and stated that it would be ready for the exhibitors in a few weeks. Foundry equipment concerns have taken space and the success of the exhibit is assured. This building, at Mr. Holmes' request, is to be the headquarters of all the foundrymen during the fair.

Satirical songs were sung as follows: "The Same Old Crowd," World's Fair Foundry Exhibit Committee," with music to "Bedelia;" "The Foundry Exhibit at the World's Fair, 1904," music to "When Johnnie Comes Marching Home." One of the pleasantest features of the entertainment was the presentation of three gavels to the associations represented, Howard Evans making the presentations. The wood from which the gavels were made was taken from one of the planks of the "Constitution," and each gavel contained an inscribed silver plate in commemoration of the occasion. The following members and guests were present:

F. E. Stockwell, Barbour-Stockwell, E. E. Durant, Hy. Souther, Theo. H. Colvin, L. H. Harper, H. A. Carpenter, S. G. H. Fitch, Mr. Robertson, G. C. Schade, A. W. Slocum, Luther Shick, Geo. R. Sullivan, H. A. May, Jr., Thos. N. Allen, Geo. C. Matlack, D. J. Thomas, H. W. Coleman, J. S. Hibbs, D. G. Moore, T. Jas. Fernley, Albin Garrett, W. H. Magoffin, Chas. N. Newcomb, John Birkinbine, A. A. Coburn, C. W. Johnson, Eric H. Ewertz, Darwin Almy, A. H. Blackburn, Jas. A. Beckett, Frank T. Wright, Thos. Devlin, Dr. E. E. Brown, J. H. Sheeler, Josiah Thompson, Geo. C. Davis, Geo. S. Rominger, Howard Evans, F. E. Hemsher, Richard C. Oliphant, Stanley G. Flagg, Jr., Wm. H. Ridgway, Wm. S. Hallowell, H. P. Jackson, F. Cooper Pullman, Thos. B. Harkins, C. C. McKee, J. S. Robeson, L. H. Woddrop, H. L. Tripple, Geo. M. Benkert, W. E. Farrell, C. D. Matthews, Thos. J. Fegley, H. C. Matlack, L. A. Hickley, A. E. Outerbridge, Benj. Holt, Dr. Wilmer Krusen, C. R. Brown, H. T. Brown, A. D. Wallace, Fred. Stahl, John McCrystal, H. E. Pierce, Godfrey Luckhardt, Jr., Earle Mark, Saml. B. Gilpin, A. R. Robb, Jas S. Stirling, J. H. Blanchard, Chas. Brown, Saml. L. Moore, Jr., W. L. Prince, Mr. Smith, Wm. A. Perrine, Oregon J. Ward, F. M. Etting, E. W. Dwight, A. L. Belfield, John R. Goehring, C. Gorman, A. Schroeder, R. J. Bartholomew, W. MacDonald, Wm. Hanson, Geo. S. Deal, Geo. T. March, Frank M. Bateman, W. O. Steele, A. G. Warren, S. A. Hibbs, W. E. Arnold, W. H. Green, G. Weaver Loper, J. F. Challenger, Ellis Y. Brown, H. B. Taylor, George C. Davies, S. H. Baird, Edward B. Cook, H. L. Grant, Philip Weiss, Wm. W. Hearne, H. C. DuBois, Frank Krug, E. H. Mumford, Louis J. McGrath, Harry Drinkhouse, M. A. Schoales, Wm. O. Thompson, H. O. Evans, Richard Mott, Wm. J. Devlin, W. E. Devlin, Frederick Devlin, T. Frank Devlin, M. D., Jas. Reilly, Oregon J. Ward, R. Keables, Louis J. McGrath, John Fleming, Thos. J. Kelley, Thos. Hobson, A. A. Miller, *Iron Age*, Philadelphia; Dr. Richard Moldenke, secretary American Foundrymen's Association, New York; Dr. David T. Day, U. S. Geological Survey, Washington, D. C.; D. C. Warren, *The Foundry*, New York; A. O. Backert, *The Iron Trade Review*, Pittsburg.

New England Foundrymen's Association.

FRED F. STOCKWELL, SECRETARY, CARE OF BARBOUR-STOCKWELL CO., CAMBRIDGEPORT, MASS.

The regular monthly meeting of the New England Foundrymen's Association was held at Providence, R. I., on Wednesday, May 11. The members met at the Union Station, Providence, at 2 o'clock, and thence the assemblage turned to its objective point, the foundry of the Brown and Sharpe Mfg. Co., which was soon reached. This shop is far famed for its completeness and modern equipment, with all manner of conveniences provided for the workmen, with molding carried out on smooth concrete floors, and iron carried about by trolley sys-

tems. Nevertheless the visitors were astonished to see the actual extent to which these labor saving appliances and economizing improvements were provided. Men were stationed at intervals to give proper direction to the party and explanations were given by the staff of the establishment which aided to a thorough understanding of the systems of work involved.

After a complete inspection of the foundry had been made the visitors took carriages which had been provided by the committee for a drive to the principal points of interest in Providence and through the delightful park system which has all the elements of country and park delightfully combined. The trip was a most agreeable one, the many turns and varied scenery contributing to the pleasure of those participating.

The meeting was held at the Wellington, where dinner was served, after which came the business session.

H. A. Carpenter reported on the foundry exhibit building at the St. Louis Exposition and the report was accepted as final. It was to the effect that the exposition authorities had assumed all responsibility for the erection and maintenance of this building.

Announcement was made that the next meeting would be held on June 8, at Boston, and that arrangements had been made with Mr. O. P. Briggs, commissioner of the National Founders' Association, to address the association on the "Apprentice Question as Related to the Foundry Business."

President Shaw then introduced Henry A. Carpenter, ex-president of the N. E. F. A., as toastmaster of the evening and his advent was greeted with applause whose heartiness gave emphatic evidence of his popularity. He extended greetings to those present on behalf of the Providence members of the association. Mr. Carpenter then presented to President Shaw the beautiful gavel which the former had received as representative of the New England Foundrymen's Association at the Philadelphia Foundrymen's Association dinner, at Philadelphia on May 4, given to Pittsburg and New England associations. The speaker referred to the address of Dr. Brown, of the Philadelphia Association, who presented the gavel to Mr. Carpenter, and read an abstract from his speech as follows:

"The wood that caps this beautiful gavel, we are told, was secured while overhauling the United States frigate Constitution—"Old Ironsides," and so named in consequence of being but slightly injured in battle with the Guerriere. She was built in Boston by Caghorn & Hartley, costing $302,719, and was launched on Sep. 20, 1797. She carried 44 guns and was of 1,576 tons burden. She is now fixed in Boston Harbor. As Commodore Talbot's flagship, she was engaged in the French war in 1800 and as Commodore Preble's flagship she was used against the pirates in the Mediterranean in 1803 and did good service. Under Capt. Hull, in 1811 and 1812, she sent a frigate to the bottom, the Guerriere, and the Java, under Baimbridge's command, and took all on board prisoners into Boston. The Constitution was taken into Boston for repairs, but in consequence of the port being blockaded, did not get out until New Year's Day, 1814. She was then under command of Capt. Chas. Stewart, who captured the frigate Cyane and sloop-of-war Levant, also four prizes. That about ended her fighting days, but the most important part comes now: In 1830 she was condemned as unseaworthy and to be broken up, but other counsel prevailed and she was ordered rebuilt in 1833. At that time Dr. Brown was picking up kindling wood from the historic ship and saved the pieces that cap this highly prized souvenir."

President Shaw responded in a very pleasing manner, accepting the historic gift on behalf of the association. The secretary was instructed to send a letter of thanks to the Philadelphia Foundrymen's Association for the beautiful gavel, also for the invitation extended to the New England association to attend the recent reception and dinner.

A report of progress was received from the committee on arrangements for transportation to the American Foundrymen's Association convention to be held at Indianapolis in June.

The toastmaster then introduced Hon. George H. Utter, lieutenant governor of Rhode Island. He extended greetings to those present on behalf of the State and was frequently applauded. The most prolonged demonstration of the night was when the speaker made reference to the settlement of the coal strike in which President Roosevelt figured conspicuously.

At the conclusion of the address the toastmaster introduced Hon. George A. Littlefield. He extended congratulations on the position of the industry represented and commented on organizations, among employers, finding much to commend in such an organization as the New England Foundrymen's Association.

The toastmaster, who had displayed a most

happy faculty in his introductory remarks, entertained the members with a number of humorous stories, some of which emanated from the reception held at Philadelphia.

On motion a vote of thanks was extended to the Providence members and the Brown & Sharpe Mfg. Co. for the delightful program provided, also to the speakers of the evening. It was the feeling of the visitors that the day had contained about the maximum of enjoyable events it could well carry. New acquaintances were formed and new connections made, and much information in the interest of the trade interchanged. Following is a list of those in attendance: Hon. Geo. H. Utter, lieut. governor of Rhode Island, Hon. Geo. A. Littlefield, Bartlett M. Shaw, A. J. Miller Jr., H. J. Burrough, Fred F. Stockwell, Wm. H. Stafford, Henry A Carpenter, J. W. Burch, Theo. M. Lincoln, Chas. F. Belcher, Robt. Blythe, Harry E. Gibby, G. H. Carson, John W. Farrar, W. H. Coffin, L. S. Brown, Wm. C. Doherty, H. E. Wetherbee, James A. Pevey, Franklin S. Pevey, J. M. Bense, W. H. Bense, E. R. Knapp, A. W. Chase, H. W. Cutter, C. H. Colvin, C. T. Colvin, Theo. H. Colvin, J. G. Aldrich, J. F. Blauvelt, C. C. Cowall, C. A. Reed, E. P. Osgood, F. B. Witherly, A. E. Shields, G. C. Shields, Patrick Shields, F. J. Stewart, B. C. Sandpaugh, A. L. Goodnow, E. A. Tutein, Alva Carpenter, O. C. Barrows, E. B. Pierce, D. F. Eagan, E. J. Lyon, J. Morpett, T. R. Scott, G. H. Lincoln, F. G. Scholfield, W. M. Saunders, F. H. Franklin, C. F. Butterworth, C, Hitch Jr., A. F. Hammett, H. L. Lovejoy, J. Connolly, Geo. V. Rogers, L. A. Colvin, M. J. Perault, E. H. Colvin, F W. Blanchard, W. T. Nicholson, C. H. Joslyn, G. W. Hamblet, C. L. Nutter, James Bowen, E. V. Hazard, D. L. Moody, Morris L. Gay, Wm. F. White, Geo. P. Sawyer, F. P. Lemard, C. E. Evans, R. W. Whitmarsh, A. Otis Smith, Geo. O. Sawyer, W. C. Skulley, W. F. Savage, C. H. Rollins, Rufus K. Jordan, W. W. Bird, R. C. Bird, G. S. Bullock, Fred W. Dixon, J. C. Wheeler, and Geo. H. Baush.

Pittsburg Foundrymen's Association.

F. H. ZIMMERS, SECRETARY, CARE UNION FOUNDRY & MACHINE CO.

At the regular monthly meeting of the Pittsburg Foundrymen's Association held at Pittsburg on Tuesday, May 10, Howard M. Hooker read a paper on "Pig Iron Warrants and Their Advantage to the Consumer." The paper was discussed at length, much interest being manifested by the foundrymen present in the warrant system. It is reproduced elsewhere in this issue: President A. W. Slocum told of the hospitality of the Philadelphia Foundrymen's Association and moved a vote of thanks for their invitation, entertainment and the gavel which was presented the association. The thanks of the association were unanimously extended. The following were in attendance:

Ellsworth Kay, Paul Kreutzpointner, S. D. Sleeth, H. E. Field, J. Keegan, Mr. Seth, Mr. McDougal, A. W. Slocum, F. H. Zimmers, Mr. Phillips, E. A. Kebler, W. J. Dorsey, R. F. Burkie, Mr. Bassett, Mr. Daft, J. H. Hillman, Wm. Yagle, W. H. McFadden, B. D. Fuller, H. M. Hooker, G. H. Hull, Jr., C. G. Smith, A. W. Smith, J. Frazier, D. P. Thomas, Bryan Robertson, T. E. Malone, Mr. Marshall, T. A. Collison, L. E. Dunlap, F. K. Smith, Jas. Fox.

New York Foundry Foremen.

F. C. EVERITT, SECRETARY, CARE OF J. L. MOTT IRON WORKS, NEW YORK CITY, N. Y.

The fourth regular monthly meeting of the New York Foundry Foremen was held Saturday evening, April 30th, at Hotel Montgomery, Jersey City, N. J. Dinner was served at 8 P. M., and after dinner President C. H. Thomas called the meeting to order and the necessary business was transacted. Dr. Richard Moldenke was then called on and gave a very interesting talk upon the American Foundrymen's Association and the Associated Foundry Foremen's Association from an educational standpoint. The Doctor's remarks were heartily applauded.

The remainder of the evening was given up to the reading of the following papers. "Sulphur," by A. M. Loudon. "Carbon," by S. M. Williams. "The Necessary Precautions to Produce a Perfect Casting," by H. McPhee.

The following were present: Dr. Richard Moldenke, J. F. Mills, Chas. Brown, Mr. Sheppard, Mr. Hanney, Mr. C. H. Thomas, Pres. F. Lancaster, J C. Burns, A. M. Loudon, Wm. McQuillains, J. DuBois, J. E. Good, J. Rooney, G. Martin, C. W. Link, T. A. Angell, H. Mc Phee, S. M. Williams, Chas. Stuart, M. McKuhen, J. Lushman, L. H. Roe, Edwin Campbell, A. W. Brown, W. Hofman, A. F. Neil, H. Flockhart, J. Spence, J. Steel, D. J. Jones, J. Geary, N. R. Marvin, D. C. Wilson, F. C. Everitt.

Newark Foundrymen's Association.

H. L. GEBHARD, SECRETARY, CARE OF THATCHER FURNACE CO., NEWARK, N. J.

The annual meeting of the Newark Foundrymen's Association was held on Wednesday, May 4, 1904, at Davis's Parlors, Broad St., Newark. After partaking of a dinner which was arranged for by the executive committee, the meeting was called to order, with President E. Maher in the chair.

The following persons were elected for officers for the ensuing year: President, G. A. Watts, Watts-Campbell Co.; Vice President, D. M. Meeker, Meeker Foundry Co.; Treasurer, G. Hannay, Oscar Barnatt Foundry Co.; Secretary, Henry L. Gebhard, Thatcher Furnace Co.; the executive committee consists of Jas. Flockhart, President, Louis Sachs, John Hewitt, F. L. Eberhardt, and F. A. Shaffler.

There was a good attendance present and some interesting topics were discussed. Photographs, taken by one of the members, were exhibited, showing the pouring of a mold containing a 20 ton cylinder casting. The meeting adjourned about 11 P. M. and everybody parted with the feeling that a very enjoyable and profitable evening had been spent.

CHICAGO FOUNDRY FOREMEN'S ASSOCIATION.

Geo. C. Nielsen, Secretary, 321 51st Court, Chicago, Ill.

THE ASSOCIATED FOUNDRY FOREMEN.

Joseph A. Murphy, Secretary, 114 West Twentieth Street, Erie, Pa.

ERIE FOUNDRY FOREMEN.

Harry E. Kies, Secretary, care of Erie Malleable Iron Co., Erie, Pa.

MILWAUKEE FOUNDRY FOREMEN.

Thomas Glasscock, Secretary, care of Pawling & Harnischfeger Co., Milwaukee, Wis.

INDIANAPOLIS FOUNDRY FOREMEN.

John Reynolds, Secretary, care of Enterprise Foundry & Fence Co., Indianapolis, Ind.

American Society for Testing Material.

The seventh annual meeting of the society for Testing Material will be held at Atlantic City on June 16, 17 and 18. The headquarters for the coming meeting will be the Hotel Traymore. An elaborate program is under preparation for this meeting and, as in previous years, the proceedings will probably be of considerable interest to foundrymen.

CORLISS CYLINDERS WITH A HALF PATTERN.

BY HARRY MALONE.

The method described in this article is not entirely new, but many of the readers of *The Foundry* may not be familiar with it. The objection to the use of the complete Corliss Cylinder pattern is that these patterns are expensive and take up a large amount of space for storage. If just as good a mold can be made with the half pattern and in approx-

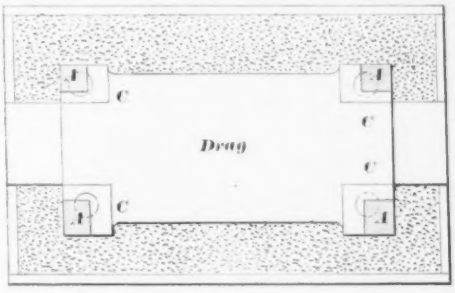


Fig. 1

imately the same time, it is evident that there will be a considerable saving in the first cost of the patterns and in their handling and storage. In following out this method a half pattern is made and the first half of the mold or drag is made either in a flask or is bedded into the floor. When this portion of the mold is completed, 4 blocks, as shown at C, Figs.

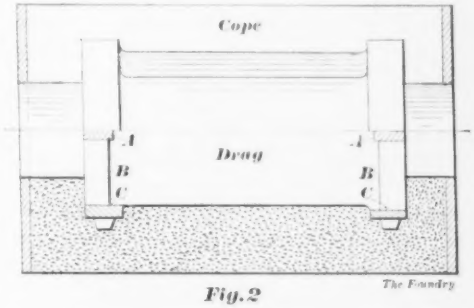


Fig. 2

1 and 2, are placed in the mold and 4 posts, B, set upon them. The posts stand in the corners of the mold and are provided with dowel pins for properly locating the pattern. The half of the pattern which was used in making the first half of the mold is simply turned over, placed on the top of these posts, and used in making the second half.

If only one-half of the pattern is used, the

edges of the mold will be somewhat broken at the joint, but these can be patched very quickly. This trouble, however, can be avoided by making a piece of the other half of the pattern which will extend into the mold about two inches and support it upon the posts B. In Fig. 2 the cylinder is represented as supported upon blocks A, placed upon the posts B.

ALUMINUM AND ALLOYS.

BY CLARENCE E. WOODEN.

In molding aluminum use the sand well burnt and work it dry as possible. The gating on heavy work and the use of risers should be about the same as in brass, but on light work a wide thin gate should be used, and on very light plates, where this kind of a gate does not run the castings, use a flat sprue as used in the stove foundries. The cores used in aluminum should be made soft, viz.: flour sand cores, rosin sand cores, and green sand cores. It is not advisable to use an oil sand core, as there is not enough give and they very often cause the casting to crack. Aluminum does not eat into the sand enough to use a facing unless one wishes to, although I have used charcoal facing. When melting never overheat the metal, as soon as melted and at proper temperature remove and pour. A fault to be found with the mixer in the foundry is to have the metal melted before the molder has finished his molds. To hold the metal or overheat it is very injurious to the metal, as it absorbs the gases; never pour it hotter than a cherry red. Just before pouring if a little phosphorus is stirred in, it helps the metal to run better and gives it a slight bluish tint; rosin can be used also. If poured too hot it will segregate in the mold and will also cause numberless pinholes. When the metal is polished the holes tear and give a very bad appearance. This trouble will be found more often where copper is used as hardening than where zinc is used, but will happen with either if the temperature of the melted metal is not kept down as far as possible. Some foundrymen use tin as a hardening ingredient, but the zinc is the cheapest and gives the best results. Tin makes the metal very brittle, and if too much is used it will crack in the mold or shortly after being shook out. Pure aluminum is a comparatively soft metal and has many of the properties of copper, and when this metal is used the best results are obtained. Very often the metal is impure, and poorer results are obtained by using them. Nickel aluminum is an alloy of nickel and copper together with aluminum, zinc alloys are a little bit darker, silver alloys give the brightest polish but are more expensive. In melting the zinc alloy melt the aluminum first, then add the zinc; a good alloy for electrical castings can be made from 94 per cent of aluminum and 6 per cent of copper. In remelting sprues, scrap or old castings always add ¼ or a little over of new metal. The aluminum ranks third among metals as regards malleability and sixth as regards ductility. To obtain the weight of aluminum divide the weight of copper by 3.3 brass, 3.1, and steel 2.9. Aluminum will stand as high as 35 per cent of zinc, the shrinkage is a little less than that of lead. Aluminum bronze should always be mixed of lake copper and pure aluminum, also forgable brass; these two metals are very strong, shrink considerably and are harder on tools than steel; ¼ pound aluminum to 100 pounds of yellow brass makes it run very easily. Aluminum yellow brass will not stand a very high water pressure. On light castings it is not necessary to flour the molds, as the aluminum prevents the brass from eating into the sand to any extent, and considerable more zinc can be used than with the ordinary yellow. The loss in melting aluminum yellow brass alloys is very great, as they run from 5 to 10 pounds to a hundred, according to the amount of zinc used, and if the metal is held in the furnace too long after being melted the loss will be still greater.

Use the Right Name.

BY JOHN DOYLE.

It is true that a large number of the names now employed for things originated in slang or from names given in derision. But any one who attempts to force a new name for an old well known article on the public is certainly adding to the great confusion which already exists in all industries. I, for one, want to register a kick concerning a circular which I received recently. The maker claimed to be selling fluorine as a foundry flux. I was familiar with fluor spar and guessed that there was probably some connection. After consulting the dictionary and a chemistry I found that fluorine was the name of a gas which nobody had ever succeeded in making stand alone or stay by itself. In other words, the moment it was free from one compound, it would attack something else to form a new

compound. It is apparent that the advertiser is simply selling fluor spar in a ground or powdered form, but why does he want to mix us poor foundry fellows up when we have already had to learn the difference between silica and silicon and a lot more things that our fathers did not have to bother their heads about?

If this friend of ours must use something besides the right name for an article, I, for one, wish that he would not use the name of one of its constituents, but would show his originality and if possible coin a name which would not confuse us by its similarity to other things. Even though I have a grudge against fellows that are always making names I could not help but admire the chap who invented the name, part-a-mole for his new dusting compound. I am not foolish enough to believe that my kick will amount to much, but I have had my say and if the editor does not knock it out it will do me a whole lot of good.

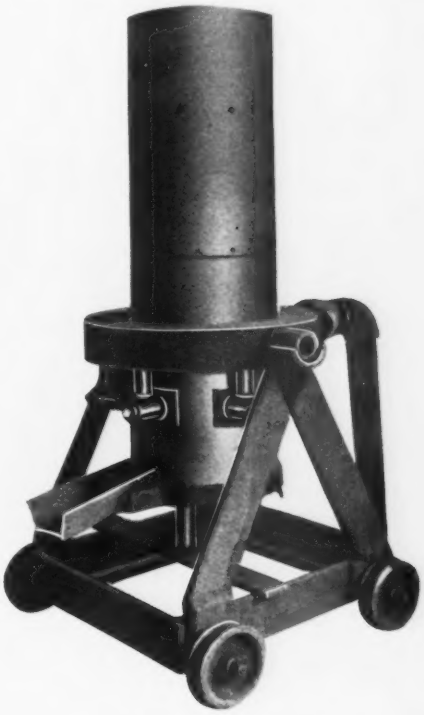
A Portable Cupola.

BY DAN GALVIN.

All foundries have to produce castings in a hurry at times, and sometimes it is inconvenient to wait for iron from the regular cupola or to fire up one of the large cupolas for a small quantity of metal. A small portable cupola such as that shown in the accompanying illustration, will be found very serviceable indeed for such occasions as this. The cupola shown is in use in Paducah, Ky. It has no stack and is set against one wall of the foundry. Air for the blast comes from the blacksmith shop, which is about 20 feet away, the air being conducted through a pipe underground and brought up behind the cupola as shown. Connection is made with the cupola by means of a gland, as shown in the illustration. The diameter of the shell is 18 inches and the height of the shell 5 feet. All of the castings for the cupola were made in open sand, and the construction was such that very little patternmaking was required.

The bussel pipe is a ring of square cross section, about 5 inches on a side. The tuyeres are made from 1½-inch pipe. The cupola is mounted upon a frame upon wheels, as shown, so that it can be moved away from the wall for cleaning and repairs. The A-shaped frame which supports the trunnion is 3 feet high, the center of the trunnion about 3 feet 6 inches from the floor.

When in use the cupola is lined with molding sand ¾ of an inch thick. A casting weighing 300 pounds can be made with this cupola, and a heat of 700 pounds of metal can be taken from it. The charges for such a heat are as follows: Three riddles of coke for the bed and 300 pounds of iron. This is followed by two charges composed of one riddle full of coke and 150 pounds of iron each, and one charge of one riddle of coke and 100 pounds of iron.

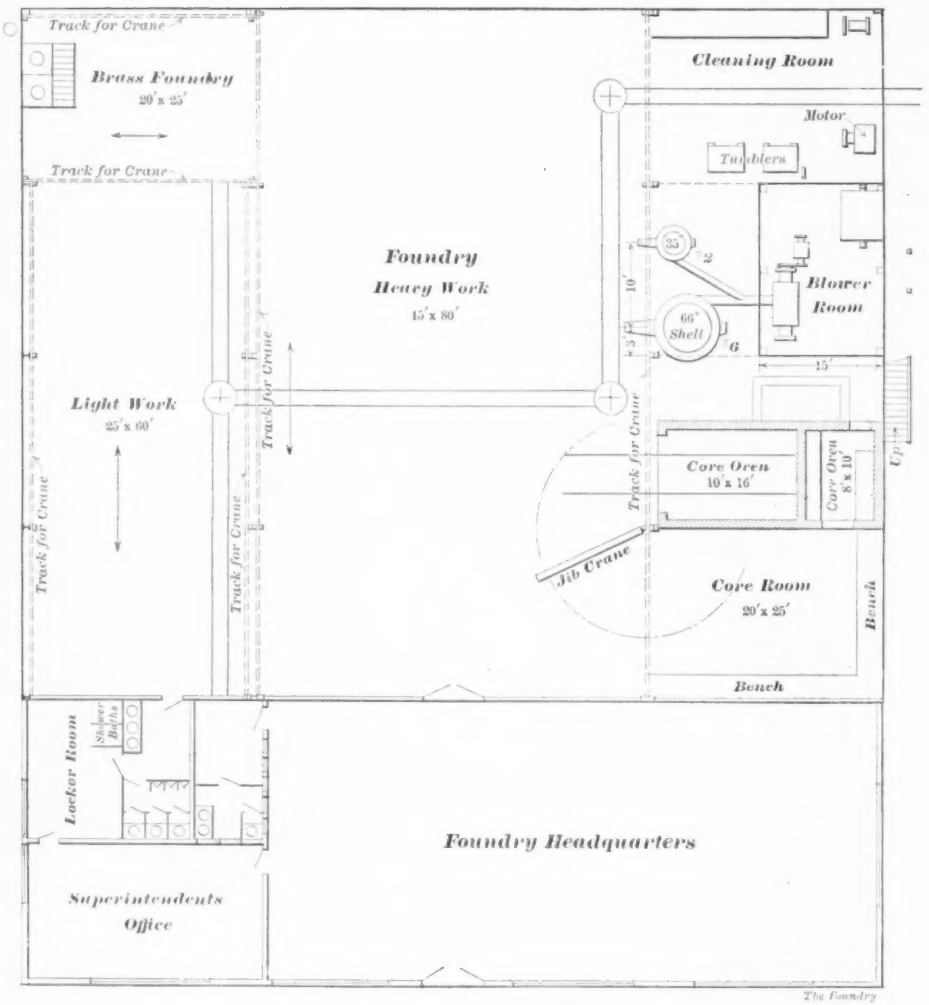


A PORTABLE CUPOLA.

The cupola can be gotten ready and hot iron available in from an hour to an hour and a half at any time. When large brass castings are required, the cupola is simply relined and from 300 to 400 pounds of brass melted in it without any difficulty.

The Greensburg Wheel & Supply Co., of Greensburg, Pa., has been incorporated with a capital of $25,000 for the manufacture of wheels and castings for mine cars. The incorporators are: Geo. S. Rumbaugh, J. R. Hayden, W. F. Hayden, M. R. Wiley and J. F. Naley.

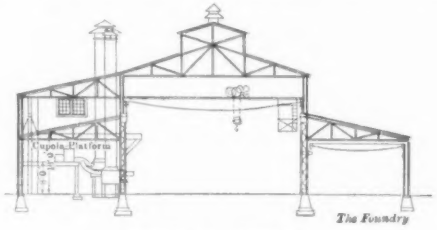
Storch & Webb, of Reading, Pa., have commenced the manufacture of brass and aluminum castings.



PLAN OF MODEL FOUNDRY AT ST. LOUIS.

FOUNDRY BUILDING AT ST. LOUIS.

The foundry building at St. Louis is practically completed, and the exhibits are now being installed. At first, it was expected that the buildings would be constructed with funds raised by subscription among foundrymen, and in this case the exhibit would have been under the care of the American Foundrymen's Association. The Exposition Authorities, however, finally decided to build it themselves, and to ask for exhibits from various foundry supply people. The final arrangement of the buildings may necessitate some changes from the plan and section here shown, and it is probable that the buildings will be made a little larger than shown on the plan. It is the intention of those in charge to have the exhibits all installed and everything in running order before the American Foundrymen's Association visits the exposition on June 10th. We



SECTION OF FOUNDRY.

will expect later in the summer to mention some of the exhibits and describe the interesting points at greater length.

FOUNDRY EXPERIENCE IN THE SOUTH.

BY JOHN JONES.

Some time ago I went down to one of the southern states to take charge of a foundry. When I got in the shop and looked around it put me in mind of a time when I was going down there some years ago. I was on the train between Chattanooga, Tenn., and Selma, Ala., when a man got on and sat along side me. We got into conversation after a time and I found out that I knew his brother, so we got quite interested in one another especially when I found out that he was a sand rat, and that he was going down to Selma where he owned a foundry, also that he had been down there since before the war of the rebellion.

So I asked him if it was true that if a man from the North went down there, that he naturally got indolent and lazy. "Well, I don't know," he said, "but you ought to have seen my shop when I went into it first, why I could not get around for pig iron, scrap, bricks, old flasks, old sculls from ladles and I don't know what, all over the shop; but you ought to see it now, it's a d—— sight worse than ever." I thought this foundry was in the same fix, or worse. They had a contract to build a structure for a large firm, and were putting up a derrick for erecting the same out in the yard where the flasks were supposed to be piled. The flasks had been there, but where were they now? All over the yard, one piece here and another there, in a promiscuous pile, so that it took me some time to straighten them out. I put a few colored gentlemen (and all the laborers are that) out there and I soon got that place looking decent.

The foundry was about 200 x 80 feet, and these sections for the building were about 5 x 5 feet and weighed from 2,800 to 3,000 lb. each, and they had cast about 50 when I got there, and they were scattered all over the shop, good and bad together. It used to occur to me sometimes when looking over them that there will be some music in the office when they come to put them up, as by what I could see there were more bad than good, and so it proved. They had two cupolas one 36 inches, one 30 inches, with two Sturtevant fans, and a poor lot of coke; the iron they used was No. 2-3 all pig. When I went there they were making two sections per day (or at least trying) but did not succeed, so I stopped trying to make two, and tried to make one good one, or until I found out what was the difficulty. One reason I thought was, there was no provision made for taking off the vent as some of them were scabbing. Well, that was stopped, but that did not mend the case much, as the castings were all rough and spongy on top. It had been some years since I had an experience like that before so it did not strike me at the time what was the matter. I saw that the iron came down dull, but it looked hot enough for a chunk like that, so I could do nothing less than blame the all pig for it. I asked the proprietor to get me some scrap. "Well," he said, "you might pick some up out in the yard." I hunted around and found about 2,000 lbs., so I charged 50 percent of that and the castings came out all right. The proprietor came in next morning. "Well, how did it turn out this morning?" "All right," I told him, "and it will be all right every morning if you get some scrap." When that scrap was used up it fell back the same way again. The superintendent came to me and said, "There is a car load of scrap down the road, I wish you would look it over and see what you think of it." I went and looked at it and gave my report as all right. "Well," said the superintendent, "don't you think there is too much wrought iron in it?" "Oh, not much, that can easily be broken out." And take it all together it was a very fair sample of scrap. "Well," he said, "they want more for that scrap than we can get pig iron for, and then we only get 2,000 lbs. scrap, and we get 2,240 pig iron, so I don't think we will get any." "Well, what are you going to do, you see that we cannot make them with all pig, and we can make them if we get some scrap," I said. "We will have to make them anyway," he said. About this time they were taking the sections out of the shop to set them up, so it came out as I thought it would, about half bad, and we had lots of scrap for a time. In taking off the heat I had to cast the light work first, because if I cast one of the sections first the light work would be left. I tried the cupola all ways but it would not do better. After we got those sections broken up the superintendent said he would go on the cupola when they were charging and see if he could do anything with it, but at the time we had a new car of good coke and we rose from one section a day with all pig and poor coke, to 4 sections a day. The proprietor came around every morning again. "Well, how are they this morning?" "All right," I said. "All right, er yes." "All right," I rejoined. "Well, how is that, is the iron hot enough?" "Yes, hot enough." "Well, how is

that?" he said. "It's because we have better coke and plenty of scrap." "Oh, I don't think that is it," said he, "it's because you have another man on the cupola." "I don't see it in that light," I said, "if the cupola man had the right stuff up there he could get the iron all right." "Oh well if that is the way you want to do business you can give the credit, and I will take what is coming to me in money." So I left them in their glory. In my wanderings around the shop I came upon a hole, it was about 6 ft. x 12 ft. and I don't know how deep, as I could not see the bottom of it for old riddles, coke, broken bricks and other rubbish, and up near one corner was a sheet iron casing about 4 ft. in diam. and it appeared to me that it had been bricked up at one time, as I could see the remains of some of them sticking to the sides of the casing. Up above the hole was a bonnet something like they use over a blacksmith fire, it was about 10 x 4 ft. leading up to a pipe 15 inches in diam. out through the roof. Well, I did not know what to make of this, but I had heard they were making guns down there at the time of the war, so I thought this must be one of their furnaces. While I was standing looking at it the superintendent came up to me, so I asked him what it was. "Why, that is a brass furnace." I told him that I was glad he told me, for I did not think that I should guess what it was in twelve months. "Yes," he said, "that was built by a foreman that we had here some time ago, and he was a very smart man, quite a genius." I thought he must have been to build a thing like that when he could build a good modern furnace at half the cost, but I did not say so.

Now a little about the sand they had there. All around that section of country it is a red clay, and the sand they had was the same nature. To illustrate, there was a man making a rubbing plate for a granite mill, when I got there. It weighed about 9 tons and it was made in loam. He had finished the bottom and was putting the loam on the top plates. When they came out of the oven there were cracks in it all over about one-quarter of an inch wide. I asked him if he had put any sharp sand in the loam and he told me that it was about one-quarter sharp sand and that was the only sand that they had there. It was a good sand in one way because it was strong enough to stand all the burnt sand from the castings to be mixed with it. It was all right for chunks but not for stove plate; if you put a shovel full of sand in the riddle you would get about one and a half shovels full of riddlings out of it. It was like gravel, you could not mend up a square corner with it anyway.

They had a lot of spiral stair to make, and the castings were to come out like stove plate. So I said. "How do you think I can make fine castings in this sand?" "Why, what is the matter with that sand?" "Well, you can see that you cannot get fine castings from that sand, it is too coarse, and you must not expect to get fine castings if you mold them in gravel." "Well, we will have to get some new sand." In about two weeks there came a small keg of sand from Philadelphia and that was all the sand I got while I was there.

Every morning a man from the office would come in and weigh every man's work, and if it did not satisfy the boss he would come in the foundry. "I have had those men's day's work weighed up," he would say, "now here is one man, he has only 250 lbs.; do you think that I can pay that man $3.00 a day and only do that much? And here is another 300 lbs., if you can tell where I can sell these castings so that I can give these men $3.00 per day, it will be all right." And so it was every morning, and I know that the men did all they could, and that if they had good sand they could do half as much again, so I told them, but the superintendent said, "Sand costs too much money." I told the superintendent one day that I would not work in that sand for $10.00 per day and guarantee the work and it took two men all they could do to mix the sand and cut it over by 8 o'clock in the morning, as it had to be turned over about 5 or 6 times to get it about right. I suppose some of the readers of this will say to themselves "I should tell them to go to ——" but I thought he was going there fast enough by the look of his face.

Now a little about the iron, as some of my readers may drop into the box, or have been in it before this time. I have used iron direct from the blast furnace, tons of it, we could tell very near by the slag what kind of iron was in the furnace; if there was any doubt about it, it did not take long to try it as the hearth of bosh of these furnaces was open we could put in a ladle, get some iron out and test it. If there was any kish on it we did not take it but let it run into the pig molds, so that when it came through the cupola the kish was gone. And I wish to advise any foundryman if they have any iron on hand that will get kishy, to mix with half

scrap; or at least, if all pig, get your iron hot, and cast it hot, then you will be all right. The iron in the foundry described came down medium hot, but as soon as it got below a certain temperature it was gone. If kishy iron is on hand and must be used, add some gray forge iron (if no scrap), low in silicon and higher in sulphur than ordinary irons. The carbon will remain where it belongs *and as* it belongs and kish will not appear. A little experience will show how much to use.

NEW BOOKS.

"Engineers' Arithmetic," by Fred H. Colvin and Walter L. Cheney, is a pocket manual of 4 x 6 inches, with 122 pages. The work is a stepping stone toward the handling of problems current in steam engineering. Calculations are the application of rules to specific examples and the authors have closely adhered to the scheme adopted in the companion volume, "Machine Shop Arithmetic," and have concisely and luminously explained many of the difficulties in the elementary stages of practical mathematics. The book has also a brief but useful glossary of steam engineering terms; tables of wrought iron pipe, average pressures for different cut-off, circumference and area of circles and properties of saturated steam. It is well bound in cloth and is mailed in stout card-board covers which ensure conveyance in perfect order. Published by the Derry-Collard Co., of New York. Price 50 cents.

"A Compendium of Drawing" and other papers from the American School of Correspondence at the Armour Institute of Technology, Chicago, are suggestive of the scope taken in the instruction courses. They indicate the character of the ability behind them, but of course there is more than the book to a correspondence course worthy of the name. There is a personal element in following the mental growth and capacity of the student as he receives special instruction, the grading of the pace to his needs, supplying explanatory data from time to time, tactful encouragement, etc., that the book arranged for a more general purpose cannot so adequately furnish. The chief aim of the present work is to acquaint the public with the practical value and scope of the instruction papers from which it is compiled and sufficient information is given to arouse in the reader a desire to know more. The school presents a varied array of courses in technical education. The two volumes of the "Compendium of Drawing" contain freely illustrated papers on mechanical drawing, shades and shadows, perspective, pen and ink rendering, architectural lettering, shop drawing, mechanism, machine design, tin smithing, sheet metal pattern drafting, in the order named. Taking one of these essays as typical of the method employed, and we may select the paper on machine design as a good example. The paper is in the first instance the product of a practicing mechanical engineer, Chas. L. Griffin, formerly professor in the Pennsylvania State College. He gives at the start a number of the limiting factors influencing design, the effect of plant conditions upon product, the commercial and theoretical potencies behind the task of design, the important questions of quantity required, lubrication possibilities and other considerations of construction and ultimate utility. Mr. Griffin then takes a concrete example in design, works out the details of the machine, gives exact reproductions of his notebook pages with calculations and rough sketches of the parts. He shows the influence of practice on theory and the importance of preserving data in neat and easily reached forms. The growth of a design from the specifications of requirements and first crude ideas of the essential shape and size of elements to final forms are interspersed with practical comments of construction concern from drafting room onward. The two volumes comprising the subjects mentioned are 6½ x 9½ inches and contain some 900 pages, well illustrated and cloth bound. Price, $8.

Suplee's "Mechanical Engineer's Reference Book," published by the J. B. Lippincott Co., Philadelphia and London. After the plates and supply of volumes of Nystron's "Mechanical Engineer's Pocket Book" were destroyed by fire, the J. B. Lippincott Co. asked Mr. Suplee, of the *Engineering Magazine*, to write a mechanical engineer's pocket book, covering all the ground covered by Nystron and bring it thoroughly up to date. It made a happy choice in picking out Mr. Suplee, as he was not only thoroughly acquainted with American practice, but his translation of Reuleaux's "Constructor" and the studies he has carried on along parallel lines had made him familiar with European engineering practice. The book not only contains such tables as are usually found in an engineering pocket book, but a series of metric tables and metric conversion tables.

The mathematical section of the book is more complete than that of most pocket books even though it is quite condensed. The work

contains a factor table which will be found useful to many. While this work will be found very useful to all connected with engineering lines, it seems especially well fitted for the mechanical engineer and designer. It is printed in clear type on good paper. There are 837 pages, 4 by 7 inches. It is bound in leather and is furnished with a thumb index for $5.50, or without the thumb index for $5. In a short review like the present, it is impossible to give a complete statement as to the amount of valuable matter contained in the work.

TRADE PUBLICATIONS.

The Northern Electrical Mfg. Co. of Madison, Wis., have issued a 36-page catalogue, 6¾ by 10 inches, entitled Bulletin No. 35, in which they describe their direct current motors and the manner in which they can be applied for driving machine tools and various classes of machinery. They have also issued several small folders 3½ by 6¼ inches, describing their different products, including direct connected gas engine and dynamo units.

Warren, Webster & Co., Camden, N. J., have issued a very neat circular 6 by 9 inches which consists of a series of pamphlets bound between stiff boards by means of brass fasteners. In this they describe different methods of utilizing exhaust steam and show the economy which can be effected in this manner.

The B. F. Sturtevant Co., Hyde Park, Mass., have issued a circular 4 by 9 inches which is a condensed catalogue of all their products and is intended for handy reference and desk use.

The Chicago Pneumatic Tool Co., of Chicago, Ill., have issued a new edition of their pneumatic hoist catalog, in which they describe all the styles of pneumatic hoists which they manufacture. The catalog also contains considerable valuable information in regard to hoisting speeds in actual practice, the consumption of air per foot of lift, and similar matters which are of interest to all who are contemplating the installation of this class of machinery.

The Hanna Engineering Works, of 120 Elston avenue, Chicago, Ill., have issued a new folder describing their pneumatic screens and shakers.

The Patterson Tool & Supply Co., of Dayton, O., are sending out a novel advertisement of their drawing instruments. When received it is apparently a blank folder or envelope just the size of a case of drawing instruments, but upon opening it up it is found to be a very clever representation of their folding pocket instrument case, together with a good view of the instruments which the case contains.

The Westinghouse Electric Manufacturing Co., of Pittsburg, Pa., have just issued a catalogue entitled Circular 1077, in which they describe their L type of direct current, series wound motors, such as are used for cranes, hoists, and general power purposes.

PERSONALS.

Mr. Thomas L. Patton, superintendent of the Central Foundry Co., of Bessemer, Ala., has resigned his position and expects to travel in the west for his health and later to return to Bessemer and engage in business for himself.

E. H. Schwartz, sailed for England and Germany recently for a three months' trip in the interest of the Schwartz melting and refining furnace manufactured by the Hawley Down Draft Furnace Co., Chicago, Ill.

Walter M. Brewer has resigned as treasurer of the Anniston, Ala., plant of the United States Cast Iron Pipe & Foundry Co. He will take a month's vacation before deciding upon where he will locate permanently.

On Thursday, March 31st, the employes of the foundry department of Filer & Stowell, of Milwaukee, Wis., presented John Reardon, foundry superintendent, with a gold watch, chain and charm. Mr. Reardon is an able foundry superintendent and has made a special study of foundry metallurgy. He has left the Filer & Stowell Co., to accept a position as superintendent of the brass, iron and steel foundries of the Bullock Electric Mfg. Co., of Cincinnati, O.

Mr. W. D. Berry has severed his connection with the Beaver Valley Metal Co., of New Brighton, Pa., of which he was the organizer and president. Mr. Berry will take a short rest or vacation and then will be in a position to enter upon other business transactions.

Joseph Ainsborough has resigned his position as foreman of the Central Foundry Co., of Detroit, to accept the position of superintendent of the foundry of the Olds Motor Works, at Lansing, Mich.

DEATHS.

Michael J. Cotter, foundry foreman for Mr. W. H. Knowles, of Ottawa, Ill., died April 22nd after an illness of two weeks. For a number of years he was foreman of the foundry of William Stormont, and later was employed by Mr. W. H. Knowles.

Mrs. Hibbs, wife of Jos. S. Hibbs, Asst. Gen. Mgr. of the J. W. Paxson Co., Philadelphia, Pa., died April 1st, after a short illness. Mrs. Hibbs was well known among foundrymen, having made repeated trips with her husband during the last twelve years, visiting all the leading cities of the country. She also attended several meetings of the foundry associations with him in different localities. Mrs. Hibbs was prominent in many charitable associations, which will miss her greatly.

Elmer Kissinger, proprietor of the Greentown Foundry Co., of Akron, O., was killed on May 4th by the bursting of an emery wheel.

FIRES.

The plant of the Canadian Foundry Co., Montreal, Canada, was damaged by fire recently to the extent of $3,500.

Fire partially destroyed Keagy & Lear's iron foundry, of Coshocton, O., on May 12th. Probable loss is $15,000.

The entire plant of the American Casting Co., of Birmingham, Ala., was recently destroyed by fire. This plant has only been in existence about four months and had cost $25,000. The insurance will amount to about $12,000.

The foundry plant of Ridgwell & Hall, Norfolk, Va., was slightly damaged by fire May 9th.

A fire of unknown origin damaged the plant of the C. Emrich Stove Company, Columbus, O., on April 16th to the extent of $2,000.

The Marion Malleable Iron Works, Marion, Ind., erected three years ago, were damaged by fire April 26th. They employed 300 men. Loss $12,000.

Nearly one-half of the extensive plant of the American Ship Windlass Co., Providence, R. I., was destroyed by fire April 22nd. The loss is estimated at $100,000, covered by insurance. The company has on hand contracts amounting to $75,000 for work for the government on machinery to be placed in battleships. Completion of this work will probably be delayed on account of the fire.

The fire which recently damaged the plant of W. E. Moss, Charles City, Ia., destroyed the second story of the machine shop, containing patterns, wood working machines and tools. The first floor, with engine, machinery and stock, was saved from serious damage and the foundry was only slightly damaged. Mr. Moss will erect a new two story building at a cost of $2,500.

Fire in the plant of the George H. Smith Steel Casting Co., 500 to 516 Clinton St., Milwaukee, Wis., caused a loss estimated at $55,000, partly covered by insurance. About two years ago the company suffered from a fire which almost entirely destroyed the plant.

The plant of the Hoffman-Billings Mfg. Co., of Milwaukee, Wisconsin, was visited by fire April 27th, the brass foundry being damaged to the extent of $600.

Dilley's foundry, at Pine Bluff, Arkansas, was damaged by fire on May 6th. The fire originated near the core oven and damaged the roof to a considerable extent. The loss is fully covered by insurance.

The plant of the Phoenix Foundry Co., Chicago, Ill., was struck by lightning on April 23rd, resulting in a fire which caused a loss of $600.

NEW CONSTRUCTION.

The new foundry of the Providence Steel Casting Co., Providence, R. I., is nearing completion. The two-story office building is separate from the foundry and the second story is reserved for chemists. The foundry is 118 x 166 ft. and is equipped with all modern appliances. The product will be steel castings from a few ounces to ten tons.

The Colonial Foundry & Machinery Co. was organized at East Norwalk, Conn., 18 months ago. During that time it has more than doubled its size and a number of improvements are now being made. A new 20-ton cupola is being erected, a new core oven is being built and other improvements are being made.

The Bridgeport Deoxidized Bronze & Metal Co., of Bridgeport, Conn., will extend their main foundry building 60 feet. The building is 100 feet wide. They will also install new cranes.

The Gould Mfg. Co., Seneca Falls, N. Y., is having plans prepared for the enlargement of its foundry and for making other additions to its plant.

Menzel & Jeffery, of Minneapolis, Minn., are planning to construct a new office building and brick addition to their foundry. The improvements will cost about $7,500.

The American Production Co., recently organized at Reynoldsville, Pa., has broken ground for the erection of a plant which will consist of three buildings; a foundry and machine shop 75 x 216 ft., a sheet metal shop 75 x 300 ft. and a third building 26 x 40 ft., two stories, which will be used for general office and drafting rooms.

The York Foundry & Machine Co., York, Pa., recently incorporated, will erect a new brick foundry 100 by 231 feet, which will be equipped throughout with modern machinery.

The Heisel Mfg. Co., of St. Mary's, O., is erecting a large foundry and machine shop for the manufacture of steam pumps.

The Simpson Hot Air Heater Co., Newark, O., contemplates the erection of a new foundry. The plans for the new addition have not yet been completed.

The Columbia Foundry Co., of New Richmond, O., will erect a foundry 80 by 125 feet.

The Cleveland Foundry Co., Cleveland, is rebuilding its Japan building and ovens which were destroyed by fire in January.

The work of clearing away the burned portions of the plant of the Malleable Iron Mfg. Co. plant, Marion, Ind., destroyed by fire April 28th, preparatory to rebuilding, was commenced the day after the fire and the new buildings will soon be in course of erection.

Work was started on April 14th on the plant of the American Radiator Co., at Litchfield, Ill. The plant will comprise three buildings merged into one in an irregular L shape. The main foundry, with core rooms, etc., will be 132 x 425 ft.; the machine shop, 97 x 160 ft. and the ware house 121 x 301 ft. Little new machinery will be required as the cupola, cranes and much other machinery will be moved from other plants belonging to the company and the rest will be largely special, built by the company on the ground.

The Beach Mfg. Co., Charlotte, Mich., has begun the erection of a foundry 90 x 155 ft. to be used for manufacturing iron culverts. Gasoline will be used for power. Nearly all equipment has been purchased. The company expects to have its plant in operation by June 15th.

Taylor & Co., of Brooklyn, N. Y., will erect a foundry 100 by 200 feet to cost about $20,000.

The Kalamazoo Stove Company of Kalamazoo, Mich., will construct several new buildings, including a foundry 120 x 280 feet.

The Southern Iron Works, Churchville, Tenn., which were destroyed by fire a few weeks ago, are to be rebuilt on a much larger scale. Work on the erection of the new buildings was commenced a few days ago. A complete line of hardware cast iron specialties will be manufactured.

W. T. Strong contemplates establishing an iron foundry, machine shop and plant for the manufacture of plows at Ozark, Ala.

The Fulton Foundry & Machine Works, of Atlanta, Ga., will construct several new buildings during the summer, including two brick and steel fire proof buildings 120 by 300 feet each and in addition to these they will build pattern shops and other small buildings.

The Bedell Structural Steel & Foundry Co., New Orleans, La., recently incorporated as successor to the Charles Bedell Structural Iron Works, will enlarge the plant and equip it with modern machinery in order to satisfy the demand which has been steadily increasing in the South.

H. E. Kimball, Oklahoma City, Oklahoma, is rebuilding the foundry which was recently destroyed by fire.

John Stock's Sons of San Jose, Cal., have let a contract for the construction of a new machine shop and foundry, to cost about $1,400.

A new stove foundry is to be built in the Missouri bottoms north of Kansas City, Kansas, by the Landrus Stove Co., recently organized with a capital of $50,000.

The Mexican Car & Foundry Co. advises us that it is building a large car plant and will erect a foundry to make car castings only. A little later the company will install a malleable iron plant, brass foundry and wheel foundry. The capacity of the shop will be about ten cars per day. The plant is located 3½ miles north of Mexico City, between the Mexican National and Mexican Central main lines. Isaac M. Hutchinson is president and general manager.

GENERAL INDUSTRIAL NOTES.

The Cape Breton Iron & Steel Co., Ltd., will erect steel, iron and brass foundry, machine, boiler and forge shops and will spend about $100,000 on a plant this year. Regarding equipment, the company states that it has not made any definite arrangement and is in the market. It will be glad to receive catalogues and other information from manufacturers.

The J. George Leyner Engineering Works Co., Denver, Colo., will build a plant this spring. The grading is nearly finished, and contracts for foundations and steel construction have been placed. All machines will be

electrically driven. There will be a complete system of fire protection. Industrial railways will connect all buildings throughout the plant. There will be a private spur from the Denver & Rio Grande Railroad. The buildings will be six in number, as follows: Office Building (shop office, only) 40 feet, by 40 feet, two stories; pattern shop, 40 feet by 101 feet; power house, 43 feet by 64 feet; machine shop, 101 feet by 206 feet; Forge shop, 61 feet by 164 feet; pattern storage building, 40 feet by 76 feet.

The Buckeye Sand Co., with offices in the Ferguson Bldg., Pittsburg, and the Schofield Bldg., Cleveland, miners and shippers of Conneaut and Kingsville molding sand, has purchased the entire output of the sand banks of the Union Sand Co., of West Springfield, Pa., for a period of five years.

The Hamilton Metal Pattern Co., of Hamilton, O., has changed its name to the National Caster Co., and will devote its energies to the manufacture of anti-friction two-wheel casters.

The Root & Van Dervoort Engineering Co., of Moline, Ill., have recently purchased a plot of ground upon which to construct some new buildings for their factory. The first building to be erected will be a factory.

The Susquehanna Foundry & Machine Co., Watsontown, Pa., recently incorporated, have taken over the brass and iron foundry formerly operated by the Pardee Car & Machine Works. They expect to manufacture light gray iron castings, and brass and iron hardware goods.

The Walton-Von Huffel Mfg. Co., has been organized at Galesburg, Ill., with a capital of $20,000, to conduct a machine shop and foundry business. The new concern is a consolidation of the Walton and Von Huffel companies. The new company will occupy the building now used by the Von Huffel Co., which will be remodeled and improved. A portable gasoline engine for general farm use will be added to the products of the company.

Miller & Beard have leased the Glenville foundry at Glenville, Pa., and will do repair work and make iron castings.

The new plant of the National Steel Foundry Co., New Haven, Conn., was put in operation recently.

The Vulcan Foundry, New Castle, Pa., has commenced work once more, after a long idleness due to lack of orders.

The Chattanooga Roofing & Foundry Co., Chattanooga, Tenn., has begun the erection of another addition to its plant. The new building is a two story stone and brick, 50 x 120 ft. and will be used as a pattern and wrought iron department. The structure will cost $5,000 and considerable new machinery will be installed. This is the second building erected by the company within twelve months. The other building was of brick, 50 x 100 ft., two stories.

The Penna. R. R. Co. are going to build a new pattern shop at Altoona, Pa. The building will be 90 by 200 feet and only one story in height, while the pattern storage building will be 90 by 200 feet and three stories in height. Elevators will be provided for handling patterns on to and off from the upper stories.

The Philadelphia & Reading R. R. Co. have purchased 27 acres of land at Newberry Junction, Pa., upon which they propose to erect shops and a foundry.

Pawling & Harnischfeger, Milwaukee, Wis., will soon begin the erection of their new plant on the 20 acres purchased by them last fall. It is expected that the plant will be completed sometime next fall. About 600 employes will be engaged.

The Fulton Foundry & Machine Works, of Atlanta, Ga., has increased its capital and as soon as it can secure a suitable site will construct two buildings 120 by 340 feet each, one to be used as a machine shop and the other to contain the foundries. They will also construct a number of separate buildings,—pattern shop, pattern storage, forge shop, etc.

The Derry-Collard Co., of New York City, have gotten out a very neat sketching tablet for sketching in isometric perspective. The tablet is ruled not only with lines at right angles, but with diagonal lines in both directions, so that sketches to scale can be made very readily.

The Evansville Stove Foundry Co., of Evansville, Ind., have secured a location upon which they will erect new works.

The York Mfg. Co., York, Pa., has started on the erection of a new pattern shop which will be 65 x 115 ft. The crane building, a large frame structure in which small cranes are manufactured, will be moved to a new location.

As soon as the Burlington road completes the work of laying the switch to the site to be occupied by the Wenzelmann Mfg. Co., Galesburg, Ill., work will be commenced on the four new buildings to be erected by that company. The buildings will be: One 52 x 176 ft., which will contain the office, pattern room and store

room; the second, of the same dimensions, will be the machine shop; the third will be 60 x 176 ft. with an L addition 50 x 50 ft., the main part to be the foundry and the L, the power house. The fourth building, a factory for the manufacture of chemicals and machinery for the manufacture of chemicals, will be 60 x 176 ft.

The Buffalo Forge Co., of Buffalo, N. Y., has issued an 8-page pamphlet illustrating and describing their hand blowers.

The iron foundry and machine shop which for the past 20 years had been conducted by Benjamin Nichols & Son, of Jamestown, N. Y., have been transferred to the Jamestown Iron Works Co. which is composed of Charles M. Nichols, Shirley S. Taylor, Louis Apgar, Emil Froding and Oscar Peterson, all former employes of the old firm.

The Bromley Foundry Co., of Albion, N. Y., has elected the following directors: Benjamin C. Mathes, Thomas A. Kirby, Frank H. Brooks and Hiram Thompson. The directors chose these officers: President, H. J. Bailey; secretary, Warren T. Bromley; treasurer, Daniel W. Hanley.

Louis P. Minkel has purchased a building formerly used as a planing mill at Hamburg, N. Y., and has fitted it up for use as an iron foundry. He will do a general jobbing business, and has purchased the necessary equipment.

The Star Iron Works, of Gowanda, N. Y., has been incorporated with a capital of $4,000 to do a general foundry and machine shop business. The incorporators are: Peter Rink, William Smith and Joseph L. Babinger, all of Gowanda, N. Y.

The Titusville Iron Co., of Titusville, Pa., is planning to increase the capacity of its plant, not by the erection of additional buildings, but by systematizing the work more thoroughly and introducing labor saving machinery.

The Cincinnati Metal Co., recently incorporated, will manufacture all grades of babbitt, solder and type metals, and will sell pig tin, lead, copper, spelter, antimony, etc. The company has secured a desirable building at 227 W. Fifth street. Officers are: Arthur E. Jones, president; H. W. Wayne, vice president, and Malcom McAvoy, secretary.

The Chandelier & Art Brass Works, of Richmond, Ind., have decided to accept the proposition of the South Side Improvement Association and locate their new works on the South Side of Richmond.

The Hance-Brown Casting Co., of Columbus, O., has been incorporated with a capital of $10,000, to do a general foundry business. The incorporators are: Harry T. Hance, Samuel Brown, Herbert B. Henderson, Joseph P. Eagleson and John W. Hance.

Joseph E. Schwab will erect a steel foundry plant to cost between $600,000 and $700,000, at or near Chicago, Ill.

The Rock River Mfg. Co., of Dixon, Ill., has installed a complete foundry in connection with its machine shop.

The Superior Brass & Fixture Co., of Chicago, Ill., has been incorporated with a capital of $2,500 to manufacture specialties. The incorporators are: Adolph Copeland, Walter Ohme, and Robert Watt.

The Whiting Foundry Equipment Co., of Harvey, Ill., will exhibit one of their three motor electric traveling cranes, of 10-ton capacity and 45 feet span, in the model foundry building at St. Louis.

The Dobson Mfg. Co., of Rockford, Ill., have completed the construction of a new foundry building 75 by 250 feet, which is designed especially for the class of work which they are doing.

J. Howard Jones & Son, Ellsworth Building, Chicago, dealers in coke and foundry supplies, has been appointed western sales agents for the Clark Cast Steel Cement Co., Shelton, Conn.

Mr. E. T. Gilliland, of Yankton, S. D., has leased the Pioneer Foundry to Messrs J. J. Rentschler and F. E. Modlin, both of Sioux City, Ia.

The Columbus Mfg. & Foundry Co., of Columbus, Miss., has been chartered with a capital stock of $30,000. The incorporators are: J. O. Banks, W. C. Richards, and others.

The Anniston Stove Foundry, of which C. W. Foushee of Lexington, Ky., is president and O. W. Snyder, general manager, has completed its plant at Anniston, Ala.

The Schwartz Foundry Co., New Orleans, has purchased a site and will use it for a manufacturing plant. Further details the company is not prepared to give.

Hillis & Sons, Halifax, N. S., announce that they have purchased the property, assets and good-will of the business heretofore carried on by James and Frank D. Hillis, under the firm name of James Hillis & Son; including the Richmond Foundry, office and salesrooms 209-211 Hollis street; also the branch store at Sydney, C. B.

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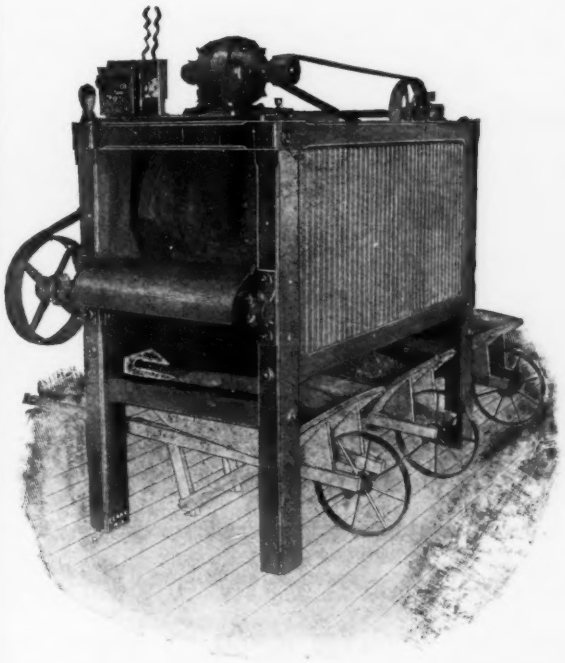

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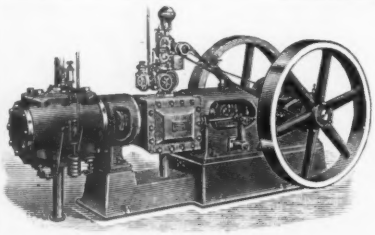

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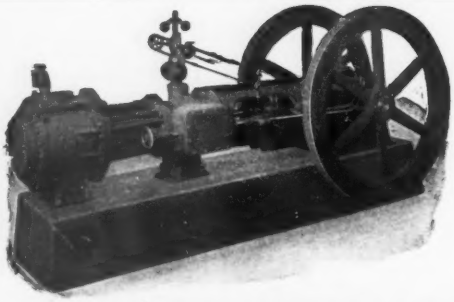

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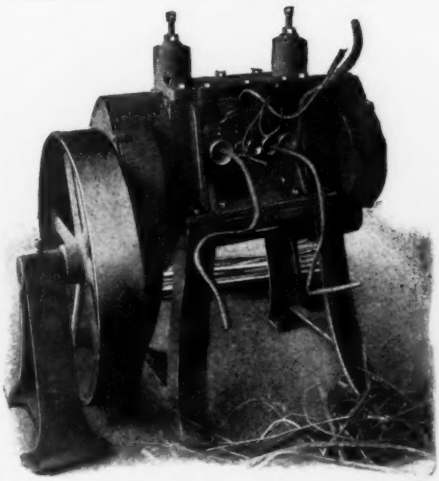

THE BLAKE

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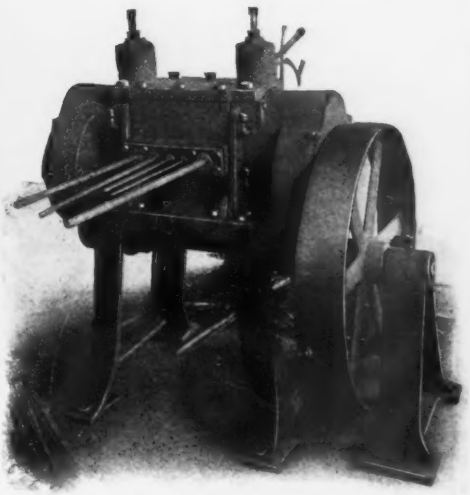

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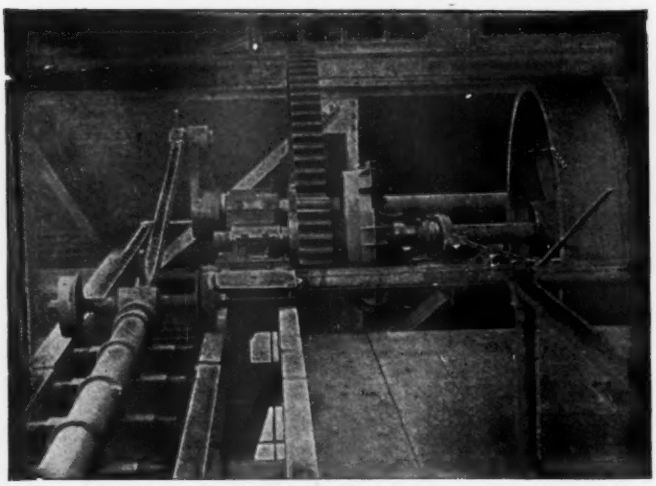

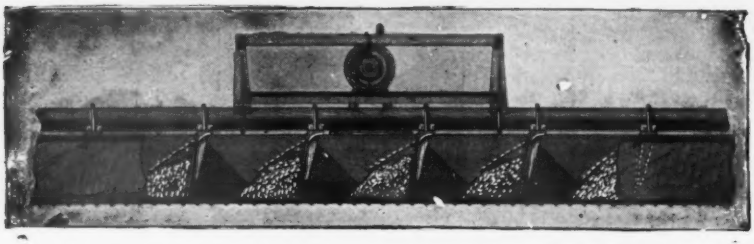

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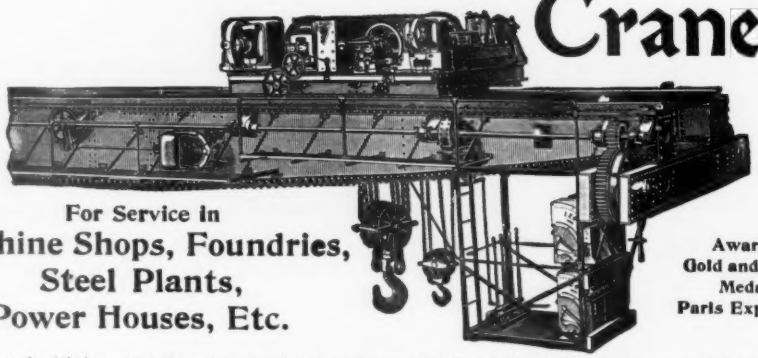

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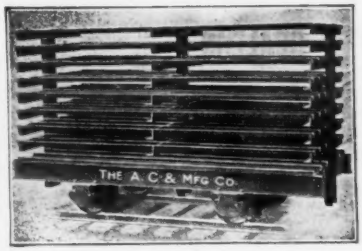

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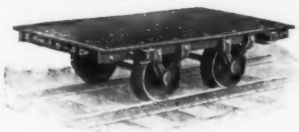

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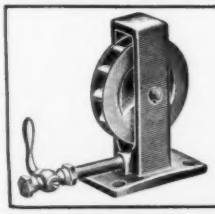

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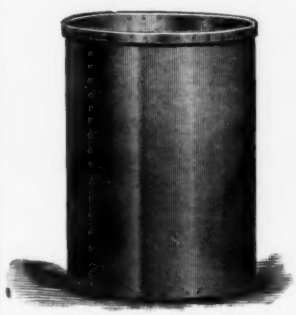

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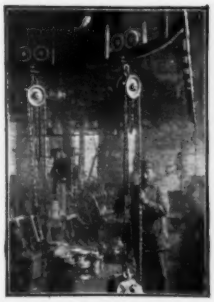

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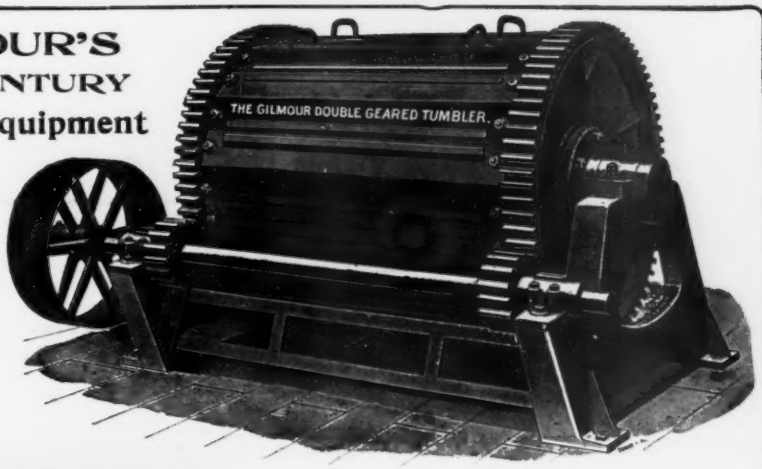

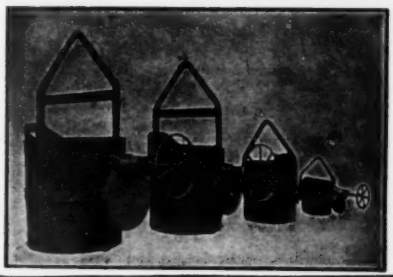

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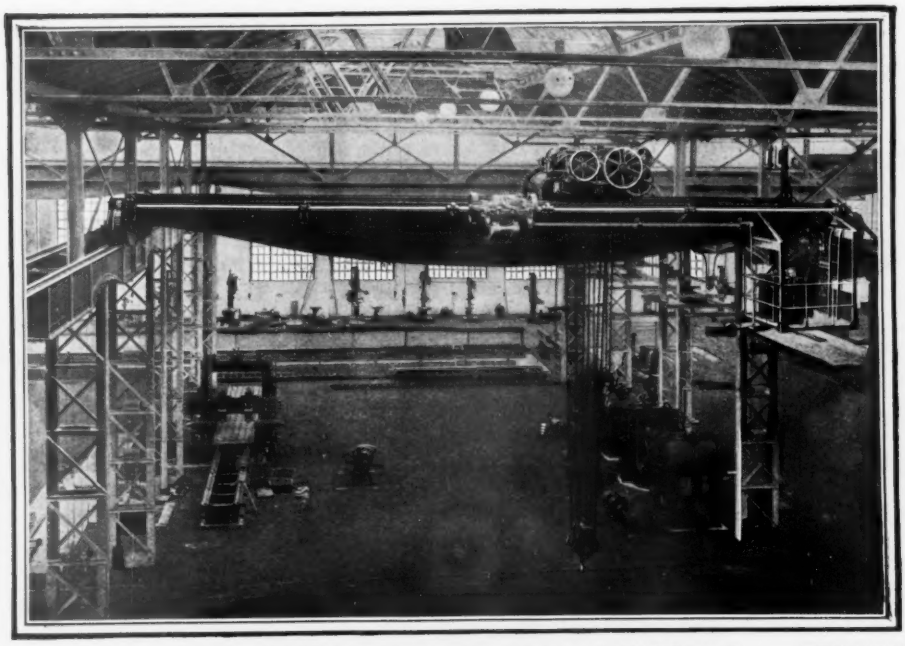

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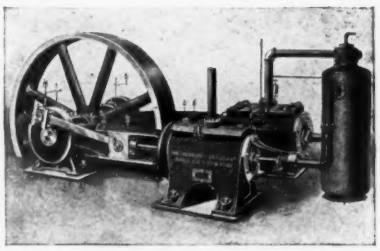

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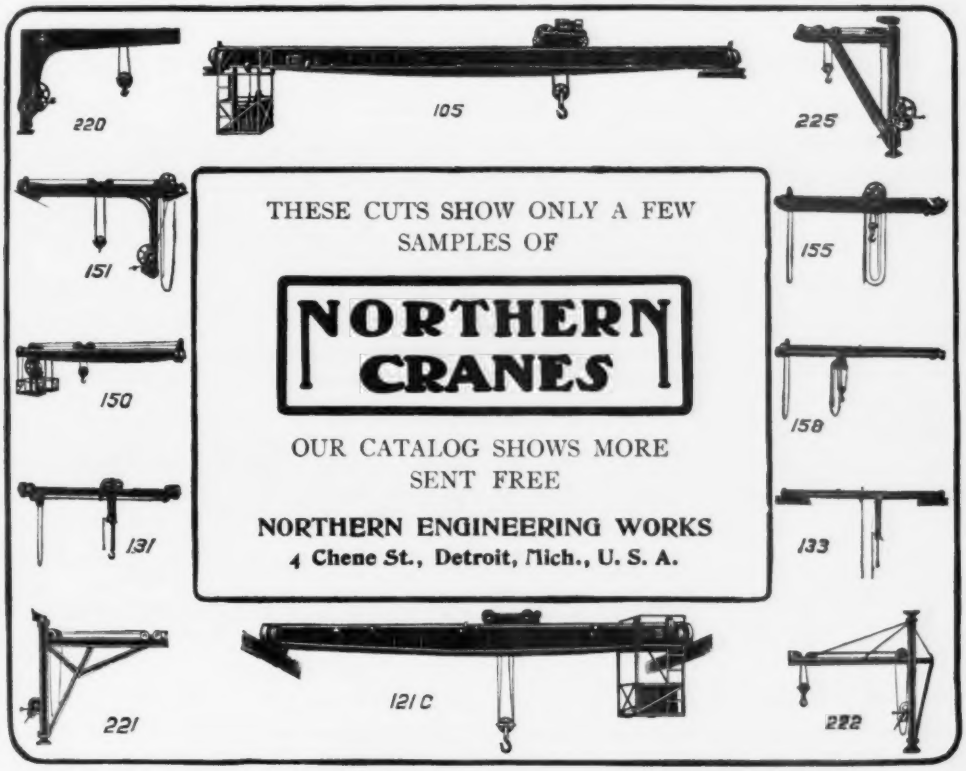

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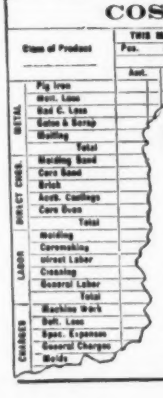

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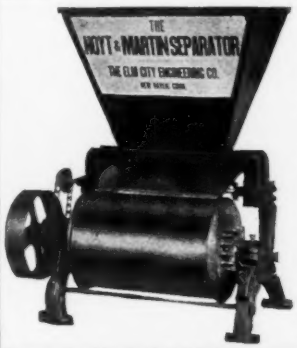

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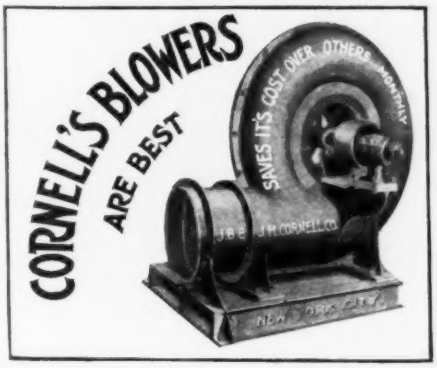

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INGOTS, CASTINGS, WIRE, RODS, SHEETS, ETC.
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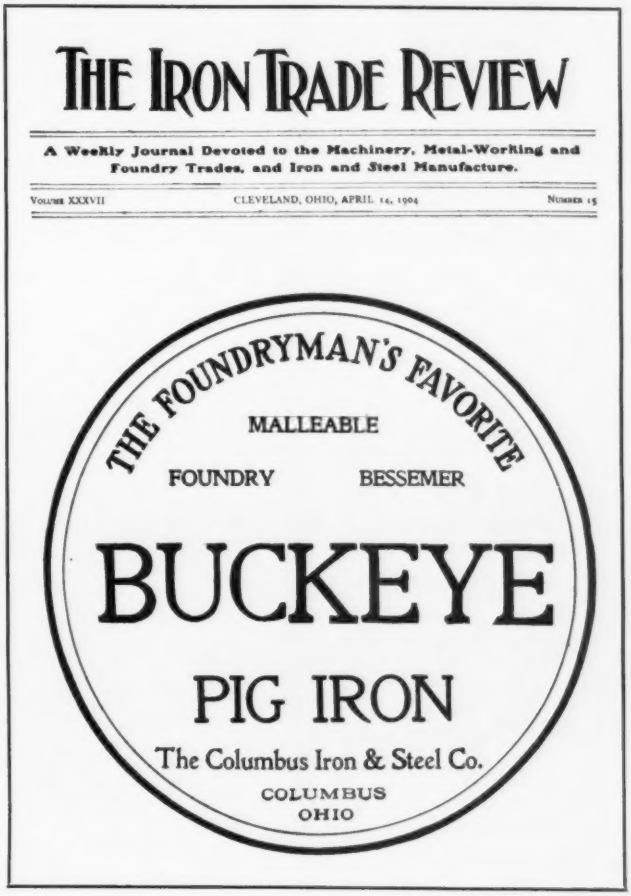

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REPORTS OF THE IRON AND STEEL MARKETS EACH WEEK

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are absolutely rust proof and coated with a material to which the iron lays quietly. This explains the entire absence of blow holes around

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Keep a stock of the standard sizes and save the time your molders spend hunting up substitutes which cause trouble and loss.

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leads everything for heavy cores. No blow or absorption of moisture.

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If you are considering such a proposition, let us go over the matter together.

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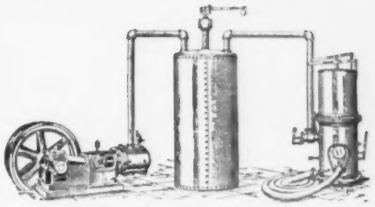

FOR

Cleaning Iron and Brass Castings—Cleaning Steel Castings—Cleaning Malleable Iron Castings — Cleaning Vessel Hulls—Cleaning Brazed Joints—Cleaning Cast Iron Bath Tubs and Plumbers' Goods, preparatory to enameling — Cleaning Structural Iron, Bridges, Etc.—Cleaning and Cutting Marble and Granite—Removing Discolorations from Overburnt Brick and Terra-cotta — Removing Glaze from Tile—Producing a Satin or Frosted Finish on Metals of all kinds—Cutting and Obscuring Glass

We have also in connection with the above our

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Particulars and Blue Prints of same furnished on application

For Cleaning Small Castings

Patent Sand Blast Tumbling Barrels

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PENTON'S FOUNDRY LIST

A complete list of all foundries in the United States and Canada. Corrected to January 1, 1904.

PRICE $10.00

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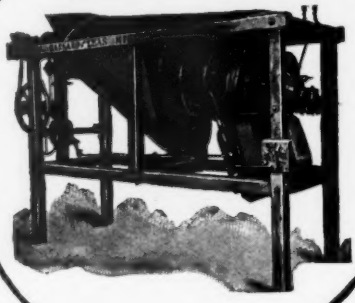

Do not throw away your profits.

Get the

MAGNETIC SEPARATOR

and separate the iron from your foundry refuse, cupola drop and slag.

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GENTLEMEN: We are very much pleased with the Separator received from you. The same having met our approval in the thirty days' trial. It meets all of our requirements and in our opinion is a strictly first class machine for the work for which it is designed.

Yours truly,
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Send for our circular "M. M."

Barnard & Leas Mfg. Co.
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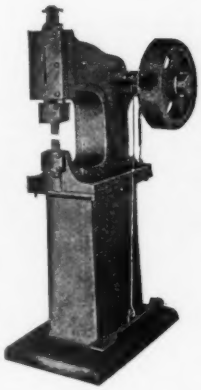

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to invest in whatever saves labor.
Every blow of the hammer on the chisel in the old chip, chipping away way of cutting gates from castings, trims down the margin of profit.

A SHUSTER POWER OR FOOT LEVER SPRUE CUTTER

operated by one man will do more than a dozen men can in the hammer and chisel way and the castings will be trimmed cleaner and closer.
We make a specialty of building automatic labor saving machinery.

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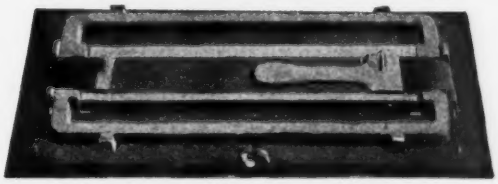
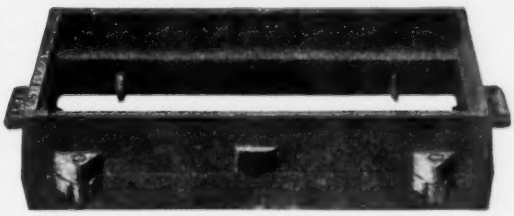
Taper steel scale which measures shrinkage.



Iron follow-board with yokes and brass patterns for test bars ½" □ × 12" long.



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3 cents and 15 minutes' time each day saves hundreds of dollars.

Regulates quality of castings.

Accurate in hands of any one.

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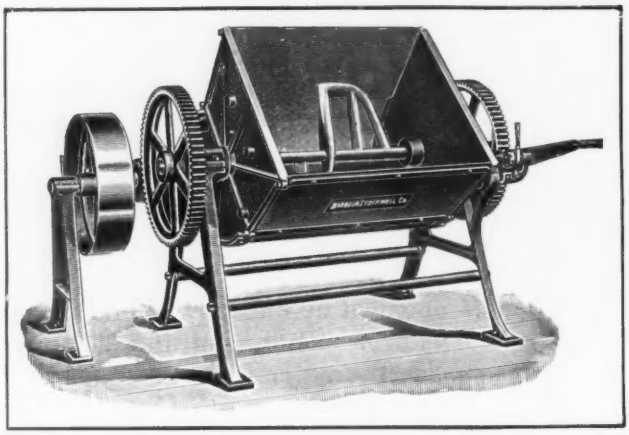
The Best Sand Mixer on the Market.



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Brass founders and others who ordered a sample bag six months ago are almost swamping us with their demands now.

Carborundum Fire Sand has exceeded all their expectations and ours.

Here is a sample of the letters we have been getting the last couple of months:

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Very truly yours,
THE MUSKEGON CUTLERY CO.
Per John A. Fletcher.

Carborundum fire sand is an amorphous form of carbide of silicon, produced in an electric furnace at a temperature approximating 7000 degrees Fahrenheit.

It is particularly valuable as a mortar for patching and lining of furnaces on account of its high infusibility and its neutral properties under the action of heated gases and fused substances.

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Northern Engineering Works

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Standard Sand Mixer and Screen Combined

The only practical mixer on the market; saves labor and material, and what is better, saves the loss of cores and helps to make better castings. Get in line and do as other leading foundries do.

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Wire Wheel Brushes

are now being very generally used by Stove Foundries, Platers and Metal Finishers throughout this country as well as in Europe. If you have castings to clean, try one of our "Economy" Wheel Brushes. It will SAVE YOU MONEY.

The brush part is made in disks or sections and the hub can be re-filled in a moment's time without returning to factory.

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It makes the most difficult cores

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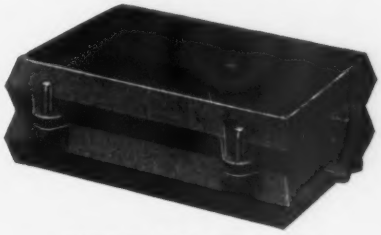
The quantity and quality of the castings made in your foundry depends very much on the kind of flasks your molders are using.

OUR FLASKS



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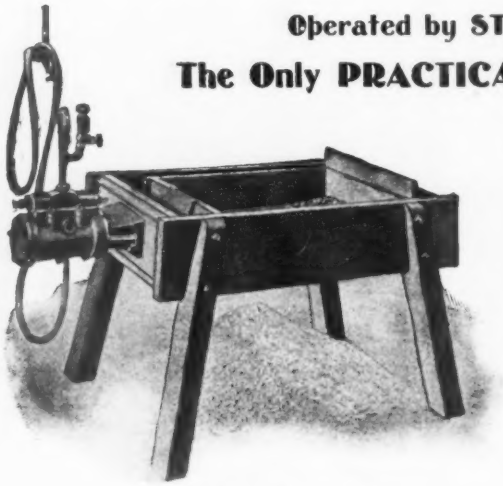
The Battle Creek Sand Sifter

Operated by STEAM or AIR

The Only PRACTICAL Machine Made



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ABILITY, SUPERIORITY and ECONOMY
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